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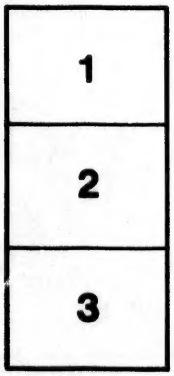

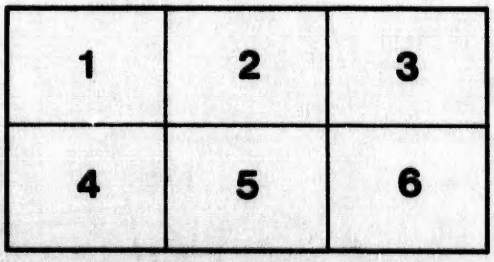

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TRELEASE

North American Species

OF

Epilobium.

1891.

The Species of Epilobium Occurring North of Mexico.

By WILLIAM TRELEASE.

(From the Second Annual Report of the Missouri Botanical Garden.)

Issued April 22, 1891.

387901

SCIENTIFIC PAPERS.

A REVISION OF THE AMERICAN SPECIES OF EPILOBIUM OCCURRING NORTH OF MEXICO.

BY WILLIAM TRELEASE.

In addition to species which have been singly described in various papers, and those treated in more restricted floras, the North American representatives of the genus *Epilobium* have been comparatively described by De Candolle,* Torrey and Gray,† and Haussknecht.‡ The first and last of these accounts include general monographs of the genus. The second, enriched by manuscript descriptions by Nuttall, has the same scope as the following revision, but of necessity refers to a smaller area of well-explored territory. The more notable works of more limited range which deal with North American representatives of the genus are Hooker's Flora Boreali-Americana (the first volume of which bears the date 1840, although the first part was issued in 1829 and the second and third parts before the end of 1832), and Brewer, Watson and Gray's Botany of California (the first volume of which was published in 1876). Both refer chiefly to west-coast species. In the former,¶ *Epilobium* is treated by Lehmann; in the latter,§ by Barbey, who subsequently published excellent illustrations of the species described there as new. ‖

The following pages contain the results of such study as

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* Prodromus, iii. 1828, p. 40 *et seq.*
† Flora of North America, i. 1840, p. 486 *et seq.*
‡ Monographie der Gattung Epilobium, 1884, p. 237 *et seq.*
¶ 1832, p. 204 *et seq.* § 1876, p. 218 *et seq.*
‖ Epilobium genus a cl. Ch. Culsin illustratum, 1888.

I have been able to give the genus during something over two years. The material employed has been chiefly that contained in the Gray herbarium of Harvard University, the herbaria of Columbia College, the United States Department of Agriculture, the Geological and Natural History Survey of Canada, and the Missouri Botanical Garden, and the excellent private collections of Mr. W. M. Canby and Mr. H. N. Patterson. My thanks are due the gentlemen owning or in charge of these collections, for their courtesy in allowing me to retain the material for the long time needed, and I am also indebted to numerous correspondents for the communication of smaller collections or single specimens.

In all of the local floras and the herbaria of the country, much confusion prevails as to the species of *Epilobium*. For this reason I have referred for synonyms to Watson's Bibliographical Index to North American Botany only in cases where little or no exception could be taken to it.

As a rule, fewer species are distinguished than can be recognized by one familiar with the rather slight specific differences that exist, and their relative importance in different groups of species. On the other hand, these differences are often so trivial and in some cases so transient, and the occurrence of intermediate hybrids is so common,* that the opinion is prevalent that Professor Haussknecht has described more species than are actually determinable. In the study upon which the following revision is based, I have tried as far as possible to account for all species indicated by him and other writers as coming within our limits, recognizing them as valid whenever satisfactory reason could be obtained for doing so. It is with reluctance that I publish several as new. It must be said, however, that increasing familiarity with the genus strengthens

* The very large number of communications on this subject, mainly referring to European hybrids, can hardly be touched on here. See Haussknecht's Monograph, and references in Just's Jahresbericht for nearly every year. In the descriptions of species, I have mentioned only those hybrids which from aberrant characters might be looked for elsewhere than with the species they are attributed to.

my impression that the characters here admitted as of specific value are worthy of credence, and do not apply to mere forms or varieties, although the less differentiated species fall into groups, which some of the most conservative botanists might justly treat as species consisting of fairly marked subspecies, in a monograph of the genus as a whole.

Epilobium differs from all other capsule-bearing Onagraceæ except the Californian *Zauschneria*, in having its seeds provided with an ample coma at the apex. *E. paniculatum*, which when dwarfed sometimes resembles large forms of *Gayophytum*, may therefore be distinguished by this character, as well as by its 4-celled fruit, even on superficial examination. The variety *jucundum* of the same species, which occasionally has been taken for *Zauschneria*, lacks the long colored Fuchsia-like tube above the ovary.

While it reaches great development in New Zealand, *Epilobium* is essentially a genus of temperate and cold climates, and the most widely distributed species are those of arctic and alpine regions. In Alaska a few such species occur, which are otherwise confined to the adjacent part of Asia. More widely distributed arctic-alpine immigrants from the old world are *spicatum*, *latifolium*, *palustre*, *Davuricum*, *glandulosum*, *Hornemanni*, *alpinum*, and *anagallidifolium*. The only other old world species represented in our flora are *hirsutum*, *parviflorum*, and *adnatum*, all of which are accidental waifs, the first one only having obtained even a precarious foothold in this country. On the other hand, while the genus passes into South America along the backbone of the continent, few species extend very far across the Mexican boundary in either direction.

The most interesting biological features of the genus are those connected with the means of vegetative propagation, pollination, and dissemination.

The various contrivances by which most species survive the winter and are vegetatively propagated, have been so

fully employed in the synopsis of species as to require no further description here, and it suffices to call attention to the extreme degree of differentiation that has been attained in this respect, in the genus, one species of which has acquired even ærial bulblets. The principal literature of the subject, aside from what is said in systematic descriptions, is to be found in *Barbey*, *l. c.* plates 23–24; *Beyerinck*, Nederlandsch Kruidkundig Archief, 1884 (Just, xii. 1, p. 546); *Haussknecht*, *l. c.* p. 11 & 16; *Kjellmann*, Bot. Centralblatt, 1886, No. 9, p. 291 (Just, xiv. 1, p. 924); *Mrs. Millington*, Bull. Torrey Club, x. 24; *Schmalhausen*, Erneuerungsweise einiger Epilobien, — Dissertation, St. Petersburg, 1874 (Just, ii. p. 531); and *Warming*, Bot. Tidsskrift, ii., and Om Skudbygning etc., Copenhagen, 1884, p. 84, 87, 95 (abstracts in Bot. Centralbl. xviii. and Engler's Bot. Jahrb. v. p. 65).

The only other vegetative features requiring special mention are the water glands ending the teeth on the leaves of most species (*Reinke*, Jahrb. für wiss. Bot. x. p. 143, pl. 12, f. 11); the mucilage glands at apex of very young leaves (*Oliver*, Journ. Linn. Soc. i. p. 190; *Reinke*, *l. c.* and f. 10); the anomalous nutations of the flower buds of *E. spicatum* (*Haussknecht*, *l. c.* p. 16; *Prentiss*, Bull. Torrey Bot. Club, ix. p. 8, and *Vöchting*, cited under pollination); and the supposed value of the acid cell-sap of some trichomes as a protection against the attacks of snails (*Stahl*, Jenaische Zeitschrift, xxii.).

The principal developmental studies are those by *Barcianu* in Schenk & Luerssen's Mittheilungen, ii. (Just, ii. 485), — punctum vegetationis and floral organogeny, and Sitzber. niederrh. Ges. f. Nat.- u. Heilkunde, 1873, — ovary; *Payer*, Organogen. p. 450, pl. 94, — flower; and *Warming* in Hanstein's Bot. Abhandlungen, ii. Heft 2, — anther. The stigmatic papillae are mentioned by *Behrens* in Anat. Bau des Griffels, etc., — Dissertation, Göttingen, 1875, p. 33. The pollen, which appears always to consist of tetrads, is discussed or figured by *Barbey*, *l. c.* pl. 13;

Behrens, Botanik, p. 82; *Luerssen*, Jahrb. wiss. Bot. vii. p. 46, pl. 5, f. 27–30; *Mohl*, Ann. Sci. nat., ser. 2, iii. p. 332 (the original paper published in German at Berne in 1834); *Strasburger*, Bau und Wachsthum der Zellhäute (Just, x. 1, p. 416); *Tschistiakoff*, Bot. Zeitung, xxxiii. p. 81, and Jahrb. für wiss. Bot. x. p. 7, with several plates; and *Halsted* and *McBride* in Bull. Torrey Bot. Club, 1890, p. 238.

While the larger flowered species appear to be regularly proterandrous, the duration of the dichogamy is brief in most of them, and the smaller flowered species seem to be always synacmic and self-fertile, although with the probability of frequent intercrossing by aid of insects attracted by the nectar which is secreted within the calyx tube (see *Behrens*, Flora, 1879, p. 246, and *Bonnier*, Ann. Sci. nat., ser. 6, viii. p. 115, note), and commonly protected by the dilated bases of the filaments or a nectar guard of hairs within the calyx. In *E. spicatum* the broad filaments are supplemented in this protective function by hairs on the lower part of the style. The principal publications on the pollination of the genus are as follows: *Beal*, Amer. Nat. xiv. p. 203; *Beyer*, Spontanen Bewegungen, Wehlau, 1888 (Just, xvi. 2, p. 523); *Delpino*, Alcuni Appunti, p. 19, Ulteriori Osservazione, ii. 2, p. 159, Bot. Zeitung, 1869, 810, and Malpighia, i. (Just, xv. 1, p. 318); *Gray*, Amer. Naturalist, 1876, p. 43, Amer. Agriculturist, 1876, p. 142, and Struct. Bot. p. 222; *Henslow*, Pop. Sci. Rev. 1879, p. 8; *Kerner*, Flowers and their Unbidden Guests, p. 102; *Kirchner*, Program, 68 Jahresfeier Württemb. Landw. Akad. Hohenheim, 1886 (Just, xiv. 1, p. 790), and Flora von Stuttgart, p. 412 *et seq.*; *Lubbock*, Nature, x. p. 403–5, and Brit. Wild. Fl. in rel. to Insects, index; *Müller*, Alpenblumen, p. 209, Befruchtung der Blumen, p. 189, Nature, ix. p. 165, and Weitere Beobachtungen, p. 237; *Schulz*, Bibliotheca Botanica, Heft 10, p. 35, and Heft 17, p. 73 and 118; *Sprengel*, Entdecktes Geheimniss, p. 4 and 223–224; *Thomson*, Trans. Bot. Soc. Edinburgh

xiv. p. 101; *Vöchting* Ber. Deutsch. Bot. Gesellsch. 1885 (Just, xiii. 1, p. 23 and 734), and Pringsheim's Jahrb. wiss. Bot. xvii. p. 301, pl. 16; and *Warming*, Bygningen . . . af grönlandske Blomster, Copenhagen, 1886, p. 32.—Except for the notes by Beal and Gray, these all pertain to observations made in the old world.

The development of the ovule, in some cases including the curious beak at what appears to be the apex, but is, in reality, the point at which the anatropous seed bends downward, on which the coma is inserted in many species, is more or less fully discussed by *Baillon*, Adansonia, xi. (Just, iv. p. 461); *Hildebrand*, Bot. Zeitung, 1872, 236–7, pl. 4, f. 6–8; and *Warming*, Ann. des Sci. nat., ser. 6, v. p. 238. The seed-coats are treated by *Barbey*, *l. c.* pl. 21, and *Marloth*, Engler's Bot. Jahrbücher, iv. The mechanism of the dehiscence of the capsules is described by *Beck*, Sitzber. Zool.-Bot. Ges. Wien, xxxv. p. 23 (Just, xiv. 1, p. 832); *Eichholz*, Pringsheim's Jahrb. für wiss. Bot. xvii. p. 573, pl. 35; and *Leclerc du Sablon*, Ann. Sci. nat., ser. 6, xviii. p. 66. The arrangements for dissemination are further considered by *Hildebrand*, Verbreitungsmittel der Pflanzen, p. 68, 69, 105, 135, 142: and *Chickering*, in Bot. Gazette, ix. p. 193, shows with what remarkable promptness the fire-weed, *E. spicatum*, appears over large forest areas after they had been burned off.

None of the species have any striking economic value.

ARTIFICIAL KEY TO NORTH AMERICAN SPECIES.

A. Stigma deeply 4-lobed or 4-cleft.
- 1. Seeds not prominently papillate, mostly smooth.
  - Flowers purple or pale, never yellow.
    - Flowers very large, opening nearly flat.
      - Seeds long and narrow, with persistent coma: pubescence not glandular.
        - Leaves with very evident looped veins: bracts small: style pubescent at base... *E. spicatum.*
        - Veins inconspicuous, rarely looped: bracts leafy: style glabrous..... *E. latifolium.*
      - Seeds broad: ovary soft-glandular: bracts reduced, ... *E. rigidum.*
    - Flowers smaller, less open: seeds short and broad, with easily falling coma..... *E. paniculatum.*
  - Flowers bright yellow, large but not opening widely: leaves broad, toothed, glabrous..... *E. luteum.*
- 2. Seeds papillately roughened under the microscope.
  - Flowers cream-colored, smaller: leaves narrow, entire, canescent..... *E. suffruticosum.*
  - Flowers purple or pale, never yellow.
    - Hirsute or tomentose with long spreading white hairs, ... *E. hirsutum.*
    - Glabrous, canescent, or short glandular.
      - Flowers very large and open: plants rather low, perennial, nearly simple above: leaves broad.
        - Leaves acute at both ends, entire..... *E. rigidum.*
        - Leaves rounded at base, repand-toothed, *E. obcordatum.*
      - Flowers less open: plants tall, dichotomous or panicled: leaves elongated..... *E. paniculatum* and var. *jucundum.*

E. exaltatum (cf. *adenocaulon*), *E. Oreganum* (cf. *glaberrimum*), and another supposed hybrid, which is mentioned under *Hornemanni*, would be looked for under *A*, because of their stigmatic characters.

B. Stigma entire or only notched: flowers never yellow.
- 1. Seeds not prominently papillate, mostly smooth.
  - Seeds broadly obovoid, very blunt: coma easily falling: leaves subpetioled, narrow, acute.
    - Glabrous or glandular, dichotomous: leaves mostly veined, often incurved or folded along the midrib: seeds very large (1x2 mm.)..... *E. paniculatum.*
    - Crisp-pubescent, simple or panicled: leaves mostly veinless: seeds half as large..... *E. minutum.*
  - Seeds fusiform: coma more persistent.

Leaves minutely revolute, ...smoother seeded forms of the group of *E. palustre.*

Leaves not revolute: stem simple or few branched below.

Leaves rather ample, ovate to elliptical, some of them usually toothed. (*E. glandulosum*, with seed papillæ collapsed, might be sought here.)

Glandular-pubescent: leaves sessile, some of them broadly decurrent: seeds very long, blunt at base, tapering above into a broad pale apex, ...*E. Halleanum.*

Crisp-pubescent in lines: leaves not decurrent: seeds shorter, more acute below, with narrower sometimes very short and abrupt beak.

Alaskan species with rosy flowers.

Erect: leaves elliptical, tapering to each end, petioled; flowers nodding.....*E. Bongardi.*

Ascending at base: leaves ovate, the upper sessile; flowers erect.....*E. Behringianum.*

Extending southward in the mountains: stems ascending at base: leaves petioled.

Flowers violet, medium sized: leaves dark green or purple: seeds blunt above, . . . exceptionally smooth-seeded plants of .....*E. Hornemanni.*

Flowers white, very small: leaves thin, light green: seeds (seen from in front) gradually attenuated to the beak.....*E. alpinum.*

Leaves quite small, usually nearly entire.

Stem ascending or almost creeping, often S-shaped, cespitose: leaves relatively broad and spreading, uniformly distributed,.....*E. anagallidifolium.*

Stem erect, not cespitose: leaves strict, the uppermost remote and linear.....*E. Oregonense.*

2. Seeds papillately roughened under the microscope.

a. Leaves linear to lanceolate, nearly entire, generally without conspicuous lateral veins.

Leaves slightly revolute: sobols filiform, at length ending in large turions: seeds large, elongated.

Simple or nearly so, crisp-pubescent: leaves sessile, usually obtuse.....*E. palustre.*

Mostly branched above; leaves more acute.

Crisp-pubescent: leaves very narrow, petioled, ...*E. lineare.*

Softly white-glandular: leaves lanceolate, sessile, ...*E. strictum.*

Leaves not revolute, sometimes involute in *paniculatum.*

Innovations and seeds as in the last group, ...hybrids of *E. palustre.*

Innovations various, never filiform.

Rosuliferous, unbranched, not cespitose: leaves very blunt, crowded below: seeds as in the last group.....*E. Davuricum.*

Annuals, with broad obovoid seeds and very deciduous coma.

Dichotomous, glabrous or glandular: seeds large (1x2 mm.).....*E. paniculatum.*

Simple or panicled, crisp-pubescent: seeds half as large.....*E. minutum.*

Turioniferous: coma more persistent. Small plants.

Branched: leaves small, acute, petioled: coma reddish.....*E. leptocarpum*

Simple, or sometimes branched below in the first and cespitose in the last: leaves sessile or subsessile: seeds broader, with pale coma.

Tomentose throughout and somewhat pilose.....*E. ursinum*, var. *subfalcatum.*

No long hairs: glabrous below or crisp-pubescent in lines only.

Not cespitose: pubescence scanty: leaves obtuse, drying light, the upper nearly linear..*E. delicatum*, var. *tenue.*

Often cespitose: quite glandular above, even as to the subacute leaves which dry dark.....*E. saximontanum.*

Soboliferous and cespitose, glaucous: seeds broad, ...*E. glaberrimum.*

Cespitose by stolons, very slender-stemmed, not pilose, occasionally glaucous in the first: seeds elongated.

Leaves erect, narrow, keeled below, ...*E. Oregonense*, var. *gracillimum.*

Leaves more spreading, broader, not keeled, ...*E. clavatum.*

b. Leaves lanceolate to ovate, evidently toothed, veiny (or often subentire and less veiny in the last three), not revolute.

Dichotomous, annual: pubescence not crisp: leaves slender-stalked, acute: seeds very broad and obtuse, ...*E. paniculatum.*

Simple or nearly so, apparently annual: pubescence crisp,.....dwarf form referred to *E. adenocaulon.*

Rosuliferous: not glaucous: leaves with at least short winged petioles.

Flowers large for the group, the violet petals 6 to 10 mm. long. Pacific species.

Stem subtomentose, little branched: leaves elliptical, obtuse: flowers protruding beyond the terminal leaves .....*E. Watsoni.*

Glabrate below, more branched: leaves ovate-lanceolate, the upper acute.

Leaves crowded above: flowers [illegible]ily surpassing the uppermost leaves: glandular pubescence coarse and dingy above.....*E. Franciscanum.*

(Young *glandulosum* and *boreale* might be sought here.)

Leaves more remote: flowers conspicuously protruding: pubescence fine, sometimes incurved, ...*E. adenocaulon*, var. *occidentale.*

Flowers smaller, the petals 3 to 5 mm. long.

Seeds obconical, beakless, 1.5 mm. long: coma reddish: leaves lanceolate, acute, sharply serrulate.....*E. coloratum.*

Seeds nearly ellipsoidal, about 1 mm. long, short-beaked at summit: coma white or pale.

Leaves narrowly lanceolate.

Much branched: leaves often obtuse, not deeply serrulate, at least the uppermost and the twigs silky.....*E. holosericeum*

Little branched: leaves acute, sharply toothed, glabrate.....*E. Fendleri.*

Leaves broader, elliptical to ovate-lanceolate.

Sharply toothed: flower buds crisp-pubescent.

Southwestern: leaves elliptical, obtuse.....*E. Novo-Mexicanum.*

Northwestern and Pacific: leaves ovate- to triangular-lanceolate: pubescence chiefly glandular, ...*E. adenocaulon.*

Alaskan: leaves broadly lanceolate, acute: pubescence crisp..*E. boreale.*

Less deeply and sharply toothed: petioles frequently very short in the first.

Pubescence fine, short-glandular (or in some forms somewhat crisp), ...*E. adenocaulon.*

Pubescence not glandular, somewhat divergent above in the second.

Finally much branched: lower leaves obtuse: pubescence short and subtomentose on flower buds...*E. Parishii.*

Little branched: leaves acute, thin and elongated: pubescence of buds coarse, somewhat spreading, ...*E. Californicum.*

Turioniferous plants only exceptionally branching, not glaucous.

Leaves petioled, small and spreading,
.....*E. leptocarpum*, var. *Macounii*.

Leaves frequently petioled, ample.

Alaskan: branching, leafy: leaves serrate, drying dark .....*E. boreale*.

Of the Columbia region: simple, less leafy: leaves low-denticulate, light green .....*E. delicatum*.

Leaves sessile (or subpetioled in *saximontanum* if looked for here, and as to occasional leaves of *brevistylum*).

Some leaves clasping-decurrent: stem mostly simple: seeds obtuse below, gradually tapering above into a broad pale beak.....*E. Halleanum*.

Leaves not decurrent: seeds acute below, more abruptly short-beaked.

Leaves medium-sized: petals about 5 mm.: seeds rather acute at top.

Pubescence long and spreading below,
.....*E. ursinum*.

Pubescence not pilose.

Leaves narrow, typically erect, acute,
.....*E. Drummondii*.

Leaves ovate-lanceolate, acute: stem very crisp-pubescent above,..young *E. boreale*.

Leaves ovate, more obtuse, drying pale: pubescence scanty.....*E. brevistylum*.

Leaves ample, broadly ovate, the upper often exceeding the inflorescence, drying dark: petals about 7 mm.: seeds obtuse at top...*E. glandulosum*.

Soboliferous, ascending at base, at length often cespitose or with sterile basal shoots.

Glaucous, without pubescent lines: leaves subsessile, ..broad-leaved *E. glaberrimum*, and its var. *latifolium*.

Not glaucous, crisp-pubescent in lines: leaves evidently petioled, rather thin.....*E. Hornemanni*.

Stoloniferous, ascending at base, quite cespitose: leaves small for the group, often nearly sessile, firm,
.....*E. clavatum*.

SYNOPSIS OF NORTH AMERICAN SPECIES.

§ 1. *Chamænerion.* — Calyx cleft almost to the ovary: corolla slightly irregular, the petals usually entire, widely expanding, their margins scarcely meeting: stamens inserted in a single series, the filaments dilated below: style at first recurved: stigma with 4 ultimately divergent lobes: capsule mostly linear-fusiform, many-seeded: seeds fusiform, beakless, not papillate in our species. — Cespitose perennials from a stout caudex bearing sessile scaly winter buds, with terete stems scaly below, and ample leaves; our species more or less canescent but not glandular.

1. E. SPICATUM, Lam. — Mostly a couple of feet high, subsimple, glabrate below; leaves as much as 150 mm. long, alternate, lanceolate, acute, nearly entire, very short-stalked, paler below, thin, pinnately veined with the evident lateral veins confluent in submarginal loops; inflorescence elongated, racemose, with small bracts; young flower-buds soon reflexed but again spreading or ascending before expansion; petals 10 to 15 mm. long; style exceeding the stamens, hairy at base; capsules 50 to 75 mm. long, from subsessile to long-stalked; seeds .4 x 1.4 mm., with very long dingy coma. — Fl. Fr. iii. (1778), 482; Watson, Index, 366. — *E. angustifolia*, β. L. Sp. 347. — *E. angustifolium*, Hausskn. Monogr. 37, and many writers. — Usually on hillsides, railroad embankments, etc., Labrador to Alaska, south to the mountains of North Carolina, Illinois, New Mexico, and the hills of southern California; also in Greenland, Europe and Asia. — Specimens examined from Maine, New Hampshire, Massachusetts, New York, New Jersey, Delaware, Ohio, Michigan, Illinois, Wisconsin, Nebraska, New Mexico, Utah, Colorado, Montana, Arizona, Nevada, California, Oregon, Alaska, and various parts of Canada and British America. — Plate 1.

Varying much in breadth of leaves, length of capsule, and degree of canescence. An albino with more than usually canescent pods is var. *canescens*, Wood, Class Book, 2 ed., 262, which is essentially the forma *albiflora* of Hausskneht, Monogr. 38, and Britton, Cat. Pl. N. J., 108. Lux-

uriant specimens collected in Alaska by Harrington, in 1872, have leaves 40 mm. wide, bracts leafy, and the style storter than the stamens but hairy at base.

Though Professor Haussknecht adopts the Linnean name for this species, it appears wiser to use that proposed by Lamarck, the typical *angustifolium* of Linnæus being according to him what is commonly known as *E. Dodonæi*, Vill.

2. E. LATIFOLIUM, L. — A span to usually a foot or more high, frequently branched, mostly glabrate below; leaves rarely 50 mm. long, usually opposite and connected below on the branches and rarely on the main stem, lanceolate to ovate, acute at both ends, entire or sparingly and minutely denticulate, scarcely petioled, pale, rather coriaceous, the mostly free lateral veins inconspicuous; inflorescence usually short and few flowered, leafy throughout, the buds not reflexed; petals 15 to 30 mm. long, rather narrow; style shorter than the stamens, glabrous; capsules sometimes short and stout; seeds .5 x 2 to 2.5 mm.; otherwise like the last. — Sp. i. (1753), 347; Watson, Index, 365; Haussknecht, Monogr. 190. — Damp places, Arctic America from Labrador to Alaska, extending southward to Canada (*Allen*), the mountains of Colorado, and N. E. Oregon. Also in the arctic regions of the Old World, extending in Asia to the Himalayas. — Specimens examined from Labrador, Canada, Repulse Bay (*Hall*), Grinnell Land (*Greely*), Montana, Colorado, Union Co. Oregon (*Cusick*), British Columbia, Alaska, and the islands of Bering Strait. — Plate 2.

Our plants belong to the less hairy and more glaucous form. The name was originally spelled *latifolia* by Linnæus. Plants from a high latitude are usually larger-flowered, with broad petals, constituting the variety *grandiflorum*, Britton.

§ 2. *Lysimachion.* — Calyx with an evident though usually short tube mostly somewhat hairy within: corolla regular, the petals deeply notched or obcordate, usually not expanding beyond funnel form, their margins then overlapping: stamens inserted in two more or less distinct whorls, those opposite the sepals longer and more deeply inserted: style not declined, mostly glabrous.

* Stigma 4-cleft: seeds beakless. — Perennials with rather slender caudex or root-stock and usually terete stems (somewhat quadrangular in *suffruticosum*, and with decurrent lines in *luteum*). — From the stigmatic characters, *E. exaltatum* and *E. Oreganum* might be looked for here.

+ Capsules linear-fusiform, as much as 75 mm. long, many-seeded: seeds beakless. — Rather tall plants with ample conspicuously veined chiefly opposite leaves, and large flowers with short and open calyx-tube.

E. HIRSUTUM, L. — Spreading by long subterranean shoots at length bulbiferous or rosuliferous at end, mostly a couple of feet high, with ascending branches, hirsute with soft white hairs; leaves as much as 75 mm. long, oblong-lanceolate, acute, prominently serrulate, sessile and frequently clasping-decurrent, thin but not very veiny; flowers rather abundant in the upper axils, erect; petals rose-purple, 10 to 15 mm. long, hairy at base within; style included; capsules short stalked; seeds oblong, densely papillate, .5 x 1.1 mm., with pale coma. — Sp. i. (1753), 347; Watson, Index, 365. — Waste grounds at various points on the Massachusetts and Rhode Island coast, and in the interior of New York and Ontario. — A European plant doubtfully established in this country. — Plate 3.

E. PARVIFLORUM, Schreber, an old world species of the pubescence and habit of the preceding, but rosuliferous at base and with very much smaller flowers, has been collected on ballast at Hoboken, N. J., by Hon. Addison Brown, but does not belong to our flora. It has also been reported as *E. pubescens*, Roth.

3. E. LUTEUM, Pursh. — A foot or two high, nearly simple, glabrate below except along the elevated lines decurrent from some of the nodes; leaves 25 to 75 mm. long, ovate or elliptical to broadly lanceolate, acute or acuminate, sinuate-toothed, sessile or when large obliquely tapering to winged petioles, slightly fleshy, rather pale; inflorescence more or less incurved- or glandular-pubescent, the flowers at first nodding, not very numerous, in the axils of the somewhat crowded and frequently reduced upper leaves; petals bright yellow, 15 to 18 mm. long;

style frequently exserted, its obconical apex mostly deeply 4-parted; capsules long-stalked, more or less puberulent; seeds obovoid, very acute at base, smooth or slightly areolated, .5 x 1.25 mm.; coma at length reddish. — Fl. i. (1814), 259; Watson, Index, 365; Haussknecht, Monogr. 245; Barbey & Cuisin, pl. 1. — Oregon to Alaska and the islands of the Northwest, east to the Selkirk Range of British Columbia. Also in eastern Siberia, *fide* Ledebour. — Specimens examined from Alaska, Washington, Oregon, and the Selkirk Range (*Macoun*).

+ + Capsules rather short, subclavate-fusiform, fewer-seeded. — Rather low and slender-stemmed more or less cespitose plants, with bark usually somewhat papery-exfoliating at base.

+ Leaves rather broad: flowers large, rose-purple: style shorter than the petals: seeds oblong-fusiform, papillate (except in the first?).

4. E. RIGIDUM, Hausskn. — A span or two high, subsimple, glabrous and rather glossy at base, glandular-pubescent above; leaves about 40 mm. long, the upper more or less alternate, lanceolate to nearly obovate, acute, entire, frequently oblique, cuneately narrowed into short winged petioles, glabrous and very glaucous, firm, with mostly inconspicuous lateral veins; flowers rather few in the axils of the reduced upper leaves which are often adnate to the bases of the peduncles; ovary densely white-glandular; calyx cleft to within 1 mm. of the base, open; petals 15 to 20 mm. long; stigma very large, its surface pilose-papillate; seeds (immature) apparently smooth. — Oesterr. bot. Zeitschr. xxix. (1879), 51; Monogr. 249, pl. 13, f. 64. — Southern Oregon: Coast Range, lat. 42° (*fide* Haussknecht); Waldo (*Howell*, July 1888, distributed as No. 698). — Plate 5.

Var. CANESCENS. — Densely velvety-canescent throughout. — Waldo, Oregon (*Howell*, July 12, 1887, No. 698).

5. E. OBCORDATUM, Gray. — About a span high, considerably branched near the base and sometimes with long

sparingly leafy decumbent branches, glabrous or with glandular inflorescence; leaves 15 to 20 mm. long, all opposite, elliptical to ovate, obtuse, remotely repand toothed, abruptly rounded to short winged petioles, typically very glaucous with inconspicuous lateral veins but drying rather thin; flowers few, often slender-peduncled, in the axils of the scarcely reduced upper leaves; calyx-tube cylindrical to funnel-form, 2 to 4 mm. long; petals about 15 mm. long; capsules less clavate, about 30 mm. long, equalling or exceeding the very slender peduncles; stigma only half as large as in the last, with short papillæ; seeds .5 x 1.5 to 1.7 mm., finely papillate; coma white or dingy. — Proc. Amer. Acad. vi. (1865), 532; Watson, Index, 365; Haussknecht, Monograph, 250, pl. 15, f. 69; Barbey & Cuisin, pl. 3. — Central California, and in the East Humboldt Mountains of Nevada (*Watson*). — Plate 6.

↔ ↔ Leaves relatively narrower: flowers smaller, cream-colored: style exserted: seeds nearly obconical, closely low-papillate.

6. E. SUFFRUTICOSUM, Nutt. — More woody and intricately much branched at base, a span high, minutely canescent throughout or at length glabrate below; leaves numerous, under 20 mm. long, mainly opposite, broadly lanceolate, acutish, entire, cuneately narrowed but hardly petioled, thick, with inconspicuous veins; flowers rather few in the axils of the scarcely reduced upper leaves; calyx-tube broadly funnel-form, about 3 mm. long; petals 5 to 8 mm. long; capsule 25 mm. long, short-stalked; seeds .8 to 1 x 2.3 to 2.5 mm.; coma long and very dingy, readily falling. — Torr. & Gr. Fl. i. (1840), 488; Watson, Index, 367; Haussknecht, Monogr. 250, pl. 13, f. 63; Coulter, Rocky Mt. Botany, 102; Barbey & Cuisin, pl. 4. — Oregon (*Nuttall*) to northwestern Montana and the Yellowstone Park. — Plate 7.

* * Stigma more or less 4-cleft in the larger flowers, usually subentire in the smaller: capsules prominently ribbed, rather short and few seeded: seeds beakless, very broad and blunt, usually abruptly con-

tracted above the base, areolate or low-papillate: coma pale, falling easily. — Mostly slender annuals with terete stems more or less glandular-pubescent above and with somewhat exfoliating bark at base, and rather firm nearly veinless leaves except in broad-leaved forms of *paniculatum*.

7. E. PANICULATUM, Nutt. — A foot or two high, loosely dichotomous, mostly glabrate at base; leaves 30 to 50 mm. long, chiefly alternate and fascicled in the axils, lanceolate or linear-lanceolate, often somewhat folded along the midrib, acute, rather sparingly denticulate, tapering to a slender winged base, gradually passing into the smaller bracts; flowers rather remote, toward the ends of the ascending branches, erect, the bracts often carried up on their peduncles; calyx-tube very narrowly funnel-form, 3 to 6 mm. long; petals about 8 mm. long, violet; capsules fusiform, falcate, ascending, about 20 mm. long; seeds 1 x 2 mm., low papillate. — Torr. & Gr. Fl. i. (1840), 490; Watson, Index, 366; Haussknecht, Monogr. 246, pl. 2, f. 27; Barbey & Cuisin, pl. 8; Coulter, Rocky Mt. Bot. 102. — San Diego county, California, to Vancouver Island, Arizona and Colorado, extending eastward through British America to the Canadian shore of Lake Huron (*Macoun*). — Specimens examined from Vancouver Island and various points in the Rocky Mountains of British America, Washington, Oregon, California, Nevada, Arizona, Utah, Colorado, Idaho, and Montana, as well as the Lake Huron specimen of Macoun. — Plate 8.

Quite variable in robustness, length of calyx-tube, size of flowers (sometimes not over 3 mm. long) and leaves, and in the staring pubescence, which sometimes stops abruptly a short distance below the ovary, while some specimens are perfectly glabrous and others very glandular throughout.

Var. JUCUNDUM (Gray). — Usually somewhat glaucous, less dichotomous, and with shorter and more thyrsoid inflorescence; leaves rather firmer; petals as much as 20 mm. long and rather widely expanding, deep violet; style frequently exserted; capsules erect and mostly crowded: otherwise like the type, which almost passes into it through

the larger-flowered forms — *E. jucundum*, Gray, Proc. Amer. Acad. xii. (1876), 57; Barbey & Cuisin, pl. 11. — *E. paniculatum*, *β. tubulosa*, Haussknecht, Monogr. 247. — California: Sierra and Siskiyou counties (*Greene*) and Plumas county (*Mrs. Ames*), to Washington (*Pringle*, *Suksdorf*). — Plate 9.

8. E. MINUTUM, Lindl. — A span or two to occasionally a foot or more high, simple or mostly with ascending branches throughout, crisp-pubescent below; leaves under 20 mm. long, usually alternate except in small specimens, narrowly to broadly lanceolate or the lowest spatulate, acutish, undulate, cuneately narrowed to the slender winged base, the uppermost scarcely bract-like; flowers rather numerous, distributed along the stem, erect; calyx-tube broadly funnel-form, short; petals 3 to 4 mm. long, violet or pale; capsules arcuate-ascending, about 25 mm. long, much narrowed to the base, short-stalked; seeds .3 to .5 x .7 to 1 mm., reticulated or low-papillate. — Hooker, Flor. Bor.-Amer. i. (1833) 207; Watson, Index, 365; Haussknecht, Monogr. 248; Barbey & Cuisin, pl. 7. — California to Vancouver Island, east to Lake Athabasca (*Macoun*). — Specimens examined from California, Oregon, Washington, Vancouver Island, and various points in British Columbia. — Plate 10.

Var. FOLIOSUM, Torr. & Gr. Fl. i. (1840), 490, is a form of the general distribution of the species, with narrow leaves much fascicled in the axils. — Specimens examined from Guadelupe Island (*Palmer*, 31), and the regions named.

While the stigma varies from nearly peltate or capitate and subentire to somewhat 4-lobed, the fimbriation which led Spach (Monogr. Onagr. 1835, 84; Ann. Sci. nat., 2 ser. iv. 174) to create for this species the genus *Crossostigma*, is not evident in any specimen studied by me. It may possibly refer to the torn pollen tubes frequently observable on old stigmas from which the germinated pollen has been rubbed away.

* * * Stigma clavate, entire or but slightly notched: coma of seeds mostly persistent. — Plants of various habit, perennial by rhizomes, stolons, turions, etc. (Exceptions are *E. exaltatum* and *E. Oreganum*, both of which have conspicuously 4-lobed stigmas.)

← Spreading by filiform remotely scaly subterranean shoots, which end in ovoid winter bulblets with fleshy scales: capsules linear-fusiform, many seeded: seeds more or less papillate, mostly fusiform, with conspicuous translucent beak at insertion of coma. — Generally slender plants with terete stems (or these with slightly prominent or pubescent lines in *palustre*), narrow minutely revolute leaves entire or rarely very remotely and obscurely denticulate, and small rosy or white flowers with short funnel-shaped calyx-tube.

↔ A foot or two high, usually corymbose above, especially in the typical form of the second: leaves numerous, ascending, chiefly alternate except the lowest, cuneately short petioled in the second only: flowers numerous, erect, in the upper axils: coma somewhat dingy.

9. E. STRICTUM, Muhl. — Pubescent throughout with soft spreading white hairs; leaves 25 to 40 mm., rather obtuse, with evident lateral veins; petals 4 to 7 mm. long; capsules 50 to 75 mm., much exceeding their peduncles; seeds .4 to .5 x 1.8 mm., nearly obconical, more prominently papillate than those of the following two species. — Catal. (1813), 39, with no description other than the word "soft," referring to the very characteristic pubescence; Sprengel, Syst. ii. (1825), 233, with description; Haussknecht, Monogr. 254. — *E. molle*, Torr. Fl. U. S. (1824), 393, but not Lamarck; Watson, Index, 365; Barbey and Cuisin, pl. 12 (the text as *E. strictum*, Muhl). — Bogs, New England, Canada West, and Minnesota, to Illinois and Virginia. — Specimens examined from various points in Canada, Maine, New Hampshire, Vermont, Massachusetts, Rhode Island, New York, New Jersey, Pennsylvania, Virginia, Ohio, Illinois, Michigan, Wisconsin, and Minnesota. — Plate 11.

10. E. LINEARE, Muhl. — Canescent throughout with short incurved hairs; leaves as long as in the last, linear-lanceolate, acute, without evident lateral veins; petals 3 to 5 mm. long; capsules 50 mm., often on long slender peduncles; seeds fusiform, .4 x 1.5 mm. — Cat. (1813), 39, with

no description further than the expression "linear-leaved;" Barton Comp. Fl. Philad. i. (1818), 133; Hausskn. Monogr. 255, pl. 2, f. 25. — *E. palustre*, var. *lineare*, Gray, and Watson, Index, 366. — Bogs, New Brunswick to the Selkirk Range (*Macoun*), south to the Yellowstone Park, Indian Territory, Illinois, and Delaware.—Specimens examined from Prince Edward's Island and various parts of Canada and British America, Maine, New Hampshire, Massachusetts, Connecticut, New York, New Jersey, Pennsylvania, Delaware, Ohio, Illinois, Wisconsin, Kansas, Indian Territory (*Bigelow*), Nebraska, and the Yellowstone region. The specimens on which Haussknecht extends the range of *lineare* to Oregon doubtless belong to the next species. — Plate 12. — Specimens with more lanceolate leaves with evident lateral veins, occasionally occur, even in regions where *E. palustre* is not found, so that they can scarcely be looked on as hybrids.

Var. OLIGANTHUM (Michx.), (*E. oliganthum*, Michx. in part), of the middle Atlantic region, a simple few-flowered form with the opposite leaves more obtuse and less evidently petioled, may perhaps be distinguished.

If the custom of replacing Muhlenberg's names, owing to incomplete description, should ever become prevalent, the very descriptive name *E. densum*, Raf. Desv. Journ. de Bot. ii. (1814), 271, may come to replace the one here employed for this species.

↔↔ A span to a foot high, usually simple, rather less woody: leaves fewer, suberect, chiefly opposite, evidently veined, gradually narrowed to a sessile base: flowers few, mostly nodding at first: coma paler.

11. E. PALUSTRE, L. — Quite canescent above with incurved hairs; leaves 25 to 50 mm. long, narrowly oblong or exceptionally lanceolate, obtuse or almost truncate; fruiting peduncles often long and slender; seeds fusiform, .4 to .5 x 1.5 to 2 mm., with prominent scarcely narrowed translucent apex. — Sp. i. (1753), 348; Watson, Index, 366; Haussknecht, Monogr. 128. — Swamps and wet places,

New Brunswick to Alaska and the northwestern islands, south to lower Canada, the mountains of Colorado, and Washington; also in Europe and Asia, extending into India: — a boreal plant, so far as our continent is concerned. — Specimens examined from many parts of Canada and British America, Alaska, Bering Straits, Washington (*Suksdorf*, 1881, as *E. coloratum*), and Colorado. — Plate 13.

Forma *Labradorica*, Hausskn. — A span or two high; leaves oblong-lanceolate to broadly lanceolate, more divergent; flowers solitary or few, very nodding. — Monogr. 131. — Wet places and bogs, Labrador to the White Mountains of New Hampshire, in the former locality, especially, passing into the usual western form. — Plate 13.

E. anagallidifolium, so far as the Eastern States are concerned, seems to rest upon this form, which in a dwarfed state considerably resembles it, but may always be recognized by its revolute leaves, very cinereous inflorescence, long, papillate seeds, and (when obtainable) filiform bulbiferous shoots.

+ + Innovations unknown: habit of *E. palustre*, but the leaves more alternate, sparingly toothed, and not revolute: seeds obovoid, beakless, slightly papillate.

E. PSEUDO-LINEARE, Hausskn. — Slender-stemmed, firm, a span to a foot high, pubescent with very short subappressed hairs; leaves as much as 20 mm. long, linear, abruptly callous-pointed, mostly prominently undulate-toothed, sessile, cinereous on both faces, rather thick and firm and without conspicuous lateral veins; petals 6 mm. long, purple; capsules 60 mm., slender, on rather long slender peduncles; immature seeds obovoid, rounded at top, .5 x 1 mm. — Monogr. 253, pl. 16, f. 73. — California, at the Russian Settlement (specimen in Hb. Petropol.), *fide* Haussknecht.

Unknown to me, and suspected by Professor Haussknecht to be a hybrid of uncertain parentage.

+ + + Producing at base of stem in late summer and autumn, rosettes of foliage leaves, sessile or ending short scaly shoots: leaves not revolute, more or less toothed: seeds papillate.

++ Habit of *E. palustre:* stems terete or with occasional low decurrent lines: seeds fusiform, prominently beaked.

12. E. DAVURICUM, Fischer. — A span or two high, mostly simple, the very slender stem sparingly incurved-pubescent, otherwise glabrous; roots densely fascicled; leaves less than 15 mm. long, somewhat crowded at base, alternate and remote above, linear or oblong, obtuse, remotely denticulate, sessile, 1-nerved; flowers pale, not very numerous, nodding; capsules erect, 40 mm., on long slender peduncles; seeds .4 x 1.5 mm.; coma white. — Hornem. Suppl. Hort. Bot. Havn. (1819), 44; Haussknecht, Monogr. 145, pl. 2, f. 23 and 36. — Bogs, Alaska to Washington (*fide* Haussknecht), east to the Selkirk Range of British America (*Macoun*). A Siberian plant. — Plate 14.

In one of Professor Macoun's specimens the beak of the seed is very narrow and .3 mm. long.

↔ ↔ Coarser, branched plants, of the habit of *E. coloratum:* stems with rather prominent ridges decurrent from some of the leaves (or these more or less evanescent in *holosericeum*): leaves usually ample, commonly toothed, and with evident lateral veins: capsules 40 to 50 mm. long: seeds mostly broadly obovoid, short-beaked, sharply papillate in rather distinct longitudinal lines, (finely papillate in *holosericeum*, nearly obconical and beakless in *coloratum*, and more fusiform in *Fendleri*).

= Large flowered for the group, with rather deep violet petals 6 to 10 mm. long: hairs within calyx-tube well developed: leaves mainly opposite, 25 to 50 mm. long. — Two species closely related to *E. adenocaulon*.

13. E. FRANCISCANUM, Barbey. — A span to mostly a foot or two high, the larger forms much branched, glabrate below, subcanescent or more or less pilose above; leaves elliptical-lanceolate to ovate-lanceolate, obtuse, with rather numerous and prominent serrations, rounded to the very short and broad petioles, the uppermost frequently pilose along the midrib, etc.; flowers at first crowded, scarcely exceeding the somewhat reduced leaves clustered at end of branches; seeds broad, very hyaline-papillate, .4 to .5 x 1 mm., the short beak also more or less papillate; coma sometimes tawny. — Brewer & Watson, Bot. Calif. i. (1876), 220; Haussknecht, Monogr. 262; Barbey & Cuisin, pl. 12. —

Esmeralda county, Nevada (*Shockley*), western central California, and Oregon (*Hall*, and *N. W. Bound. Surv.*). — Plate 15.

The larger, more glabrous and compound form, figured by Barbey & Cuisin, approaches the usual Pacific variety of *adenocaulon*, the flowers of which are sometimes rather large but more loosely arranged. Specimens collected by Macoun on Vancouver Island and in the Rocky Mountains of British Columbia, are doubtfully referred here, though they may belong to *adenocaulon*. The smaller, more closely crisp-hairy form approaches the next species, and is well represented by *Hall*, no. 177 *a*, from Oregon. A curious simple plant with large glossy thin leaves, scarcely to be referred elsewhere, occurs from Queen Charlotte's Islands, B. C. (*Dawson*, July 10, 1878, no. 1932 in hb. Macoun.)

14. E. WATSONI, Barbey. — Becoming a foot and a half high, with less marked lines, softly crisp-downy throughout; leaves elliptical, rather obtuse, slightly denticulate, rounded to short winged petioles; flowers not very numerous, suberect, in the axils of the gradually reduced more lanceolate and acute upper leaves; seeds coarsely papillate, .3 x 1.25 mm., barely umbonate at top; coma dingy. — Brewer & Watson, Bot. Calif. i. (1876), 219; Haussknecht, Monogr. 263; Barbey & Cuisin, pl. 6. — Various parts of California, *fide* Haussknecht. — Known to me with certainty only in the original specimens in Hb. Gray. from the Russian settlement, but young plants from Mariposa county (*Congdon*, 1890) can hardly be referred elsewhere. What commonly passes for this is the preceding species. — Plate 16.

= = Petals 3 to 5 mm. long, pale to mostly rather deep rose-colored: leaves for the most part alternate: otherwise like the preceding group.

a. Narrow-leaved for the group.

15. E. HOLOSERICEUM, n. sp. — Rather woody, loosely branched, at least the upper leaves and branches canescent with subappressed hairs; leaves 50 mm. long, rather re-

mote and smaller on the flowering branches, oblong-lanceolate, obtuse or exceptionally acute, undulately low-serrulate, narrowed or abruptly contracted and then cuneately narrowed into short petioles; flowers produced in long succession along the elongated branches, erect, pale, barely 5 mm. long; fruiting peduncles about 10 mm. long and equalling the leaves; seeds short-beaked, very finely papillate, .4 x 1 mm.; coma white or somewhat dingy. — California: San Bernardino county (*Parish*, 1881, no. 1022) and Kern county (*Heermann*, Aug. 1853, in Hb. U. S. Dep. Agr.). Possibly also Mariposa county (*Congdon*, 1882).— Plate 17.

Innovations have not been seen by me, and Mr. Parish considers the plant to be probably annual. In pubescence it most nearly approaches *E. Watsoni*, while the rosy flower-buds are somewhat as in *E. Californicum*.

E. ADNATUM, Griseb. (*E. tetragonum* of most old world writers, but not of Linnæus nor of American botanists), a large European species collected on ballast near Philadelphia (*Martindale*, June 1878, in Hb. U. S. Dept. Agr.), is related to the last in being pubescent above with short closely appressed straight white hairs, and in having its rather acute sharply serrulate leaves typically oblong with nearly parallel margins; but it differs from all of our rosuliferous species in that some of the leaves are broadly sessile with the margins decurrent on the stem into prominent subglabrous lines. Its seeds are very rough.

16. E. FENDLERI, Hausskn. — Slender, virgate, little branched, the inflorescence and flowers cinereous with incurved hairs; leaves 25 to 75 mm. long, narrowly lanceolate, acute, rather sharply low-serrulate, gradually narrowed to very short winged petioles; seeds with very short scarcely pellucid beak, .3 x 1 mm.; coma white.— Monogr. 261.— New Mexico (*Fendler*, no. 217 in part, *fide* Hausskneeht; *Wright*, 1851, no. 1065 in part, and 1849, no. 953, — in Hb. Gray., not distributed). — Plate 18.

b. Broader-leaved, the foliage often purple in autumn.

17. E. COLORATUM, Muhl. — Glabrate below, the rather numerous panicled branches canescent with incurved hairs at least along the decurrent lines, and more or less glandu-

lar towards the end; leaves 50 to 150 mm. long, lanceolate to oblong-lanceolate, acute, deeply and irregularly serrulate, mostly gradually narrowed to conspicuous slender petioles, glabrous except the uppermost, dull, thin, rugose-veiny; flowers very numerous, more or less nodding; petals 3 to 5 mm. long, rosy; fruiting peduncles slender, mostly short; seeds obconical-fusiform, beakless, strongly papillate, .3 x 1.5 mm.; coma at length cinnamon-colored, at least at base. — Willd. Enum. i. (1809), 411; Hausskneht, Monogr. 258; Barbey & Cuisin, pl. 9. — Wet ground and meadows, Canada to South Carolina, west to Wisconsin, Nebraska, and Missouri. — Specimens examined from Ontario, Maine, Massachusetts, Connecticut, New York, New Jersey, Pennsylvania, Virginia, South Carolina (*Ravenel*), West Virginia, Ohio, Illinois, Missouri, Kansas, Nebraska, Iowa, and Wisconsin. — Plate 19.

This species, the general type of which is reproduced in a number of others which here follow it essentially in the order of their leaf and habit resemblance, differs from all of its congeners in the degree of serration of its leaves and especially in its elongated seeds destitute of the usual apical beak, and from all with which it is likely to be confounded, in the nearly cinnamon-colored ripe coma (which, however, is white in immature capsules that have dehisced while drying). It is apparently everywhere associated with *E. adenocaulon*, which begins to flower and fruit about a fortnight earlier, and differs in its very short-stalked leaves, rounded at base and less sharply toothed, and in its shorter seeds abruptly contracted and hyaline-beaked above, and with pure white coma. West American specimens which have been called *E. coloratum* belong, for the most part, to forms of *adenocaulon*.

18. E. Novo-Mexicanum, Hausskn. — With upcurving branches throughout, glandular-pubescent or subcinereous above; leaves 50 mm. long, elliptical-lanceolate, rather obtuse and prominently serrulute, mostly gradually narrowed to small winged petioles: otherwise about like *E.*

adenocaulon, from which this species appears barely separable by the more elliptical form and sharper serration of its leaves, and its more cinereous pubescence. — Monogr. 260. — New Mexico (*Fendler*, 1847, no. 217, in part; and *Bigelow*, on Whipple's Exped. 1853–4). — Plate 20.

E. AMERICANUM, Hausskn., Oesterr. Bot. Zeitschr. xxix. (1879), 118, and Monogr. 260, founded on specimens collected in the Saskatchewan region (*Bourgeau*, Aug. 1857), would appear to differ from *adenocaulon* only in its more sparing pubescence and smaller acute leaves, and I cannot separate it. According to Haussknecht, small plants of *Americanum* occur in the herbarium of the Museum at Paris, which are labeled "*E. tenellum*, Raf. Mts. Catskill, Et. Un. leg. Rafinesque," — but which are said not to agree with Rafinesque's description of *E. tenellum* (*E. palustre*). Such specimens seem to come very near what I regard as a very dwarf erect-leaved form of *adenocaulon*, collected in the White Mountains of New Hampshire (*Miss Prince*), the Catskills of N. Y. (*Peck*, 1880), on the Pic River (*Loring*, in Hb. Gray.), on Prince Edward Island (*Macoun*), and in the Rocky Mountains (*Bourgeau*, 1858, in hb. Gray., etc.), — which may be the *E. ciliatum* of Rafinesque in Journ. Bot. i. (1808), 229. These have crisp-pubescent peduncles, etc. As yet, however, there is too much uncertainty about the matter to warrant the application of the name *ciliatum* to either plant, unless for this dwarf form (Plate 22) either as a variety under *adenocaulon* or as a valid species immediately preceding it.

19. E. ADENOCAULON, Hausskn. — Habit of the preceding, the inflorescence, capsules, etc. very glandular pubescent and with few if any incurved hairs; leaves 50 or exceptionally 70 mm. long, frequently erect, elliptical to mostly ovate-lanceolate, obtuse, only slightly serrulate or denticulate, abruptly rounded to short winged petioles, rather pale green and glossy, glabrous except the uppermost, which are gradually reduced and seldom as rugose as in *coloratum;* flowers (mostly nodding at first) and capsules as in *coloratum;* seeds obovoid, .3 x 1.1 mm., abruptly short beaked; coma white. — Oesterr. Bot. Zeitschr. xxix. (1879), 119; Monogr. 261. — *E. coloratum*, in part, of most writers on the flora of the eastern and middle States; *E. tetragonum* of most writers on western botany, but not of Linnæus. — New Brunswick to Oregon, south to Pennsylvania, Utah and California: the Pacific Coast forms

passing into the next variety. — Specimens examined from New Brunswick and various parts of Canada and British America, Maine, New Hampshire, Massachusetts, New York, Pennsylvania, Michigan, Wisconsin, Minnesota, Montana, Colorado, Utah, Oregon, and California. — Plate 21.

Var. OCCIDENTALE. — Remotely leafy, especially the mostly strict very glandular branches; leaves more triangular-lanceolate, 50 mm. long on the main stem, erect, prominently denticulate, very short-stalked, those of the inflorescence small and acute at both ends. — Vancouver Island and British Columbia to central California, and Nevada? (*Shockley*, 509, in Hb. Gray.). — So far as can be judged from fragments of the inflorescence kindly sent me by Dr. Urban, the plants raised in the Berlin Garden from Montana seed (*Krausse*, 1882), and referred to *E. Chilense* by Haussknecht (Monogr. p. 273), may belong here; for although the lower leaves are described as different, the upper leaves are acute at base and evidently stalked. — Plate 23.

Plants from Utah, Arizona, etc. (*Palmer*, 1877, Beaver City, No. 156), Siskiyou county, California (*Pringle*, 1881, no. 110), Boulder, Col. (*Henry*, 1874), etc., have the coma dingy, and the foliage and even the lower part of the stem very glandular-puberulent, and in aspect they approach *Novo-Mexicanum*. They appear to be comparable with the most glandular form of *paniculatum*, already referred to.

This variety, which appears to be best developed in the upper Pacific region, sometimes comes too near *E. Franciscanum*, but differs in its usually smaller flowers less corymbosely clustered and more acute at base, and in its shorter glandular pubescence. It passes into the type by numerous specimens from California and the adjacent and northern region, some of which, however, are more cinereous than the eastern form of the species.*

* E. EXALTATUM, Drew, Bull. Torrey Bot. Club, xvi. (1889), 151, which Professor Greene informs me is the common tall plant of the northwest coast, would appear to be this variety, were it not for the fact that

Var. ? PERPLEXANS. — Slenderer, sub-simple or with few ascending remotely leafy branches, less glandular, the inflorescence sometimes canescent with incurved hairs; leaves scarcely 50 mm. long, divergent, lanceolate, rather obtuse and sparingly undulate-serrulate, thin and light green, the upper acutely tapering to slender sometimes elongated petioles. — Yellowstone Park to Oregon, Colorado, New Mexico, and California, apparently more abundant in the eastern part of the range. — Specimens examined from the Yellowstone, Oregon (*Hall*, 176 in part), Colorado (*Wolf*, 1873, 154), New Mexico (*Wright*, 1065, in part; *Bigelow*, 356), Arizona (*Palmer*, 1869), Nevada (Truckee Valley, *Watson*, 1867, 395 in part), and California (*Rothrock*, 1875, 217; *G. R. Vasey*, 1880). — Plate 25.

In aspect somewhat resembling *E. Californicum*, to which, perhaps, it is to be joined; but with the incurved pubescence of *E. Fendleri* and other relatives of *adenocaulon* on the flower-buds, etc. (which in some specimens are very cinereous), and more closely connected by intermediate forms with *adenocaulon* than with any other species.

20. E. CALIFORNICUM, Hausskn. — Tall, rather slender, somewhat branched, glabrous below, the inflorescence and buds white with long and rather coarse ascending hairs; leaves often 75 to 100 mm. long, lanceolate, subacute, rather remotely serrulate, rounded or acutely tapering to short petioles, soon glabrous; flowers comparatively few; fruiting peduncles slender, sometimes nearly equalling the leaves; capsules at length nearly glabrous; seeds almost beakless, .4 x .9 mm.; coma white. — Monogr. 260. — California: (Near the Russian settlement, *Wrangell*, 1833, *fide*

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authentic Californian specimens, for the privilege of examining which I am indebted to Professor Greene and Dr. Britton, possess larger flowers with broad prominently 4-lobed stigmas. The specimen from Mr. Drew in the Columbia College Herbarium has innovations in form of open turions with decidedly fleshy scales, in this respect approaching *E. boreale*. It is quite unlike any of the species characterized by a 4-lobed stigma, and may, perhaps, prove to be a hybrid. — Plate 24.

Haussknecht; San Diego county, *Palmer*, 1875, 94 in part and 142; Santa Cruz Island, *Greene*, 1886). — Apparently this species, but with more appressed pubescence, in the Santa Rita Mountains of Arizona (*Pringle*, July 8, 1881.). — Plate 26.

Somewhat intermediate between what I have placed under *adenocaulon* as var. (?) *perplexans*, and the next species.

21. E. PARISHII, Trelease.—Tall, at length stout and rather intricately branched even from the base, glabrous below, the inflorescence and capsules very sparingly, the young buds densely white tomentose; leaves 25 to 75 mm. long, lanceolate, very obtuse or the reduced uppermost leaves acutish, somewhat unequally serrulate or denticulate, gradually or abruptly narrowed to slender more or less elongated winged petioles, rather thin and glabrous; flowers at length numerous, suberect, rosy; fruiting peduncles about 15 mm. long; seeds short beaked, .4 x 1 to 1.25 mm.; coma white.— Zoe, i. (1890), 210. — San Bernardino county, California (*Parish*, Nov. 1889, nos. 2094 and 2095, the former apparently summer seedlings or offsets from the latter); and near Todos Santos, Lower California (*Brandegee*, Jan. 22, 1890), — unless this, with more closely crisp flower buds, should prove to be *E. Mexicanum*. — Plate 27.

‡‡ Habit and general characters of the preceding group, but innovations in the form of very short rhizomes ending in open fleshy-leaved turions below ground or developing into rosettes or tufts of thin leaves when they emerge: leaves not revolute.

22. E. BOREALE, Hausskn.— Becoming large and considerably branched, glabrate below, very crisp-pubescent above even as to the young leaves and flower buds; leaves 50 to 75 mm. long, ovate to lanceolate, gradually very acute, coarsely denticulate to almost serrate, the upper rather gradually narrowed to evident petioles, thin; flowers finally abundant, erect, rosy, 5 mm. long; capsules at length glabrate, their crisp-pubescent peduncles scarcely 5 mm.

long; seeds and coma about as in the last.—Monogr. 279.—Grown at the Berlin Garden in 1883 from seed collected in Alaska by Krausse; Alaska, *Fisher*, 1880, in hb. Engelm., and probably *Meehan*, 1883, in hb. Canby.

I am indebted to Dr. Urban for a specimen gathered in the Berlin Garden by himself in 1883, and for another gathered in 1884 by Mr. Hennings, from which the above description is drawn. Haussknecht's original description would make the species more closely related to *E. Bongardi* than to *Californicum* or *adenocaulon*,—which I should place these specimens near. Except in pubescence they approach an Idaho specimen of what I take to be *adenocaulon* in the Hb. U. S. Dept. Agr. (*Hayden's Exp.* 1872), which, however, is densely short glandular throughout. I have not been able to consult a later note by Professor Haussknecht on this species, which was published in 1886 (Mittheil. Geogr. Ges. f. Thüringen, iv.—*fide* Just's Jahresbericht, xiii. 2, p. 284.)

+++ Producing globose or ovoid sessile or subsessile subterranean winter bulblets (turions) with fleshy scales: seeds papillate and more or less beaked.—Mostly simple or subsimple plants with the leaves usually opposite and suberect, not revolute. (Exceptions as to innovations occur in *E. Drummondii* and *E. leptocarpum*, var. *Macounii*, and the latter species is much branched and therefore with leaves chiefly alternate. The seeds of *E. Halleanum* are often nearly or quite smooth.)

++ Leaves mostly broad and ample or of medium size and with evident lateral veins (except in two varieties), sessile or subsessile except in forms of *delicatum* and *saximontanum*: stems with more or less prominent lines decurrent from some of the nodes except in some of the smaller forms.—Subsimple, with nearly erect leaves except in the first.

= Larger plants, a foot or two high, except in a variety each of *delicatum* and *ursinum* and in some forms intermediate between *Drummondii* and *saximontanum*.

23. E. DELICATUM, n. sp.—Slender stemmed, glabrous except for the crisp-hairy lines above and slightly crisp-hairy or glandular inflorescence; leaves as much as 75 mm. long, mostly very divergent, chiefly ovate-lanceolate and obtuse, undulately low-denticulate, rounded to the very short narrow base or cuneate and somewhat petioled, thin

and pale; flowers few, nodding; petals 5 to 8 mm. long, violet; capsules 40 to 60 mm., their slender peduncles about half as long; seeds finely papillate, .3 x 1 mm.; coma dingy. — Union county, Oregon (*Cusick*, 1880, No. 911, as to the larger plant, and 1882, no. 550). Specimens from the upper Flat Head River (*Canby*, 1883, No. 132), with more pubescent stems, acuter leaves, and shorter peduncles, apparently also belong here. — Plate 28.

In delicacy of leaves, this species approaches *alpinum* and especially *Californicum*, from which it differs in pubescence, innovations, etc.

Var. TENUE. — A span or so high, with narrow more erect leaves and few pale flowers. — With the type, under the number 911. The unusually large turions appear to form fleshy but more or less green rosettes when exposed to the light, in this respect approaching the preceding group. A specimen with small turions from Washington (*Brandegee*, 1882, no. 284), may go here. I cannot separate from this variety, specimens from Gray's Peak, Col. (*Patterson*, Aug. 7, 1875), but these are out of the usual range of this species, and in that of *E. saximontanum*. — Plate 28.

24. E. GLANDULOSUM, Lehm. — Tall and rather thick (but soft) stemmed, the largest specimens branched, commonly somewhat loosely crisp-pubescent above or with very flexuous glandular hairs; leaves typically crowded near the summit, frequently exceeding the inflorescence, 80 to 120 mm. long, broadly ovate or ovate-lanceolate, the upper acute or sub-acuminate, prominently serrulate, mostly abruptly rounded to the base, drying dark; flowers erect, near the end of the stem; petals 5 to 7 mm. long, more or less purple; capsules about 60 mm., short-stalked, occasionally quite pubescent; seeds coarsely hyaline-papillate or with the papillæ often entirely collapsed, very blunt above, .5 x usually 1.5 to 1.8 mm.; coma dingy. — Pugillus, ii. (1830), 14; Haussknecht, Monogr. 273. — Alaska and across the islands of the northwest to Asia. Forms too near this also in British Columbia. — Plate 29.

Young specimens doubtfully referred here occur in the Gray herbarium from Labrador (*Allen*, 1882, no. 11, as *E. coloratum*), but I am unable to find specimens authenticating the general distribution ascribed to the species by Professor Haussknecht, on whose authority it was admitted to the sixth edition of Gray's Manual.

The separated decurrent lines of some Arctic specimens are more or less wing-like, then bearing prominences similar to the marginal teeth of the leaves, from which the specific name is said to be derived.

25. E. BREVISTYLUM, Barbey. — Slenderer and less pubescent; leaves scarcely 40 mm. long, ovate or ellipiticals more loosely and uniformly distributed along the stem, less toothed, drying pale, the uppermost reduced and surpassed by the nearly glabrous capsules; seeds slightly smaller, tapering above, the papillæ similar; coma less dingy. — Brewer & Watson, Bot. Calif. i. (1876), 220; Barbey & Cuisin, pl. 13. — Springs, etc., Washington to California. — Apparently too close to the last by specimens from British Columbia and Colorado (*Vasey*, 1868, No. 184; *Engelmann*, 1881), which are rather in the region of *Drummondii*. — Plate 30.

I am unable to find the original specimen in the Gray herbarium, but the figure of Barbey & Cuisin seems to represent the form here described, which is of very different appearance from the large Arctic form of *glandulosum* to which Haussknecht doubtfully joins it.

E. affine, *β. fastigiatum*, Nuttall in Torr. & Gr. Fl. i. 489, which might be thought to refer to this form, proves (at least in Hb. Torrey.) to be *E. glaberrimum*, var. *latifolium*, with leaves rather more dentate than usual.

26. E. URSINUM, S. B. Parish, in herb. — A span to a foot high, slender, both leaves and stem below pilose with rather remote and spreading long white hairs, the inflorescence minutely glandular-pubescent; leaves less than 30 mm. long, rather uniformly and in larger plants remotely

distributed, ovate or broadly lanceolate, the upper subacute and serrate, the lower blunter and finely denticulate or nearly entire, very abruptly rounded to the sessile base; flowers few, erect or somewhat nodding; petals white or lavender, about 5 mm. long; capsules ascending, 30 mm. long, on very slender peduncles of more than half their length, soon glabrous; seeds often very rough, short-beaked, .5 x 1.5 mm.; coma rather scant, white.—San Bernardino county, California (*Parish*, 1882, no. 1619) to Washington (*Suksdorf*, 1880, 372). A specimen from the Snake River (*Hayden*, June 15, 1860) also appears to go here.—Plate 31.

Var. SUBFALCATUM.—Lower but often branched below, almost without decurrent lines, densely tomentose or pilose to the glandular shorter inflorescence; leaves narrower, sometimes falcate, entire or remotely and inconspicuously denticulate, mostly obtuse, more cuneate at base, more tomentose, and with inconspicuous lateral veins; capsules at first very short stalked.—California (*Gray*, 1872; *Mrs. Austin*, 1877; *Pringle*, 1882) to Oregon (*Howell*, 1887, no. 694).—This bears the same relation to *ursinum* that the var. *tenue* does to *delicatum*.—Plate 32.

27. E. HALLEANUM, Hausskn.—Tall and slender, glandular-puberulent throughout or soon glabrous below; leaves remote, mostly ascending, 20 to 30 mm. long, ovate- or oblong-lanceolate, the lower obtuse, decidedly undulate-serrulate, abruptly sessile or some of them clasping-decurrent by the broad base; flowers and capsules ultimately rather remote in the upper axils; petals 5 to 6 mm. long, pale to mostly rather deep violet; capsules about 50 mm., on slender peduncles of nearly equal length and exceeding the subtending leaves; seeds sometimes smooth, usually very finely papillate, .4 to .5 x 1.5 to 1.7 mm., fusiform, blunt at base, with gradually narrowed pale apex and hyaline beak; coma scarcely dingy.—Monogr. 261.—Vancouver Island (*Macoun*, 1887, nos. 9 and 9*b*), Washington (*Suks-*

dorf, 1881, no. 15), and Oregon (*Hall*, 1871, nos. 176 and 178 in part).—What may be a verticillate-leaved form of this, collected in Oregon by Nuttall, occurs as *E. glandulosum* in the Gray and Torrey herbaria.—Plate 33.

Well marked by its decurrent leaves and the peculiar apex of its large seeds. Suksdorf's specimens bear well-developed turions, removing the species from the rosuliferous group in which Professor Haussknecht placed it in the absence of innovations.

28. E. DRUMMONDII, Hausskn.—A span to mostly a foot high, glandular above, the decurrent lines subglabrate; leaves 25 to 40 mm. long, typically remote and erect, lanceolate to almost linear-lanceolate, rather acute, the upper, especially, denticulate, mostly rounded to the subsessile base; flowers erect; petals 3 to 4 mm. long, usually pale; capsules 30 to 50 mm. long, slender-stalked; seeds .3 to .45 x 1.2 to 1.4 mm.—Monogr. 271.—Mountains, from Montana to Colorado and Nevada.—Young specimens with leaves in whorls of 3, from British Columbia (*Macoun*, 1875, no. 1935 in hb. Macoun.), may belong here.—Plate 34.

This, the more typical form of *E. Drummondii*, is very closely related to *E. brevistylum*, but differs in its narrower more toothed leaves not so pale when dry, its more finely and sharply papillate seeds, and in the fact that its turions often lengthen at base into short sobols. With more glandular pubescence above and still more deeply toothed leaves, it approaches *E. Halleanum*, from which it differs in its smaller seeds and leaves never decurrent-clasping. Smaller plants, with broader more divergent leaves, greatly obscure the limits between this and the next species.

= = Smaller plants scarcely over a span high. (Varieties of *delicatum* and *ursinum* might be sought here.)

29. E. SAXIMONTANUM, Hausskn.—Somewhat crisp-hairy at least along the elevated lines, and glandular above; leaves about 20 mm. long, mostly crowded and ascending

or suberect, oblong to elliptical, the upper rather acute, very minutely denticulate or subentire, cuneately narrowed to the sessile base, — or the lowest 30 mm. long, more lanceolate, and with somewhat elongated winged base; flowers few, pale to deep violet; capsules short stalked; seeds slightly larger and often less papillate: otherwise like the preceding, except for the sessile turions. — Oesterr. Bot. Zeitschr. xxix. (1879), 119; Monogr. 270. — Mountains, Colorado to Nevada. — Plate 35.

The broader-leaved form figured (Arizona, *Knowlton*, 1889, no. 151, etc.) is barely distinguishable from broader-leaved forms referred to the preceding species; but the specimens are commonly without innovations, and hence may belong elsewhere, though at present I am unable to place them otherwise.

↔ ↔ Leaves rather small, with less conspicuous lateral veins, evidently petioled: stems terete but sometimes pubescent in lines. — Much-branched small plants, with the rather spreading leaves therefore mainly alternate.

30. E. LEPTOCARPUM, Hausskn. — A span or less high, glabrous except for some incurved pubescence on the stem; leaves less than 20 mm. long, broadly lanceolate, sparingly low-toothed, tapering from near the middle to the obtuse or subacute apex and winged petiole; flowers abundant for the size of the plant; calyx-tube narrow; petals about 3 mm. long, rosy; capsules 20 mm., on very slender peduncles of nearly equal length; seeds nearly ellipsoidal, shortly hyaline-beaked, .25 x .75 mm.; coma at length cinnamon-colored. — Monogr. 258, pl. 14, f. 67. — Oregon (*Hall*, no. 188). — Suggestive of some small rosuliferous species of the *coloratum* group, and so placed by Haussknecht, in the absence of innovations on the only specimens known. — Plate 36.

Var.? MACOUNII. — Less branched, crisp-pubescent in lines, the same pubescence more or less abundant also on the flowers and capsules; leaves more ovate; seeds 1 mm.

long; coma paler. — Lake Athabasca (*Macoun*, 1875, no. 692), to Washington (*Suksdorf*, 1885, no. 551).—Plate 37.

Innovations occur in the form of small slightly elongated turions which may lengthen into closely scaly rhizomes and develop into leafy shoots in the first season.

Simple, taller, thicker-leaved plants of the general habit of this variety were collected at Glacier Bay, Alaska, by G. F. Wright in 1886 (Hb. Gray.), but I hesitate to place them definitely. They also suggest in some respects forms of *E. Hornemanni*. Some specimens resembling this variety also occur in the herbarium of the Lepartment of Agriculture among Watson's plants ftom Utah and Nevada.

‡ ‡ ‡ Producing subterranean scaly branches (sobols), which ultimately turn upward and usually develop at once into leaty shoots.

↔ Glabrous (or occasionally very slightly glandular above), and glaucous: stems terete, slender, rather tall except in the variety, usually somewhat cespitose: leaves mostly simple and opposite, subsessile, with faint lateral veins: flowers erect or suberect: seeds obovoid, scarcely beaked, coarsely papillate.

31. E. GLABERRIMUM, Barbey. — About a foot high, simple or nearly so; leaves erect or ascending, often remote, as much as 50 mm. long, all but the lowest lanceolate, rather obtuse, entire to slightly repand, mostly cuneately narrowed to the sometimes subpetioled base; petals purple to nearly white, 4 to 8 mm. long; capsules 75 mm., linear-falcate, usually conspicuously stalked; seeds .3 to .5 x 1 mm., very rough with blunt papillæ, abruptly rounded to the short insertion of the barely dingy coma. — Brewer & Watson, Bot. Calif. i. (1876), 220; Barbey & Cuisin, pl. 5. — *E. pruinosum*, Hausskn. Monogr. 252, pl. 15, f. 70. — Washington (*Suksdorf*, 1878 and 1885) and Oregon (*Howell*, 1887, no. 696), to various parts of California; a broader-leaved form also in California, and Nevada (*Anderson*, 1864, no. 7). — Plate 38.

Var. LATIFOLIUM, Barbey. — Rather firmer stemmed and more branched, sometimes dwarf; leaves more diver-

gent, scarcely 25 mm. long, broadly ovate to ovate-lanceolate, mostly subcordately contracted to the very short base. — Bot. Calif. i. (1876), 220. — *E. glaberrimum*, Hausskn. Monogr. 252. — *E. affine*, β. *fastigiatum*, Nutt. in Torr. & Gr. Fl. i. (1840), 489, as to the specimen in the Torrey herbarium. — Oregon to California and the Wahsatch Mountains of Utah, — apparently most developed about the outer range of the species. — Small specimens approach *E. Hornemanni* in habit. — A restoration of Nuttall's name would cause the variety to be known as *E. glaberrimum*, var. *fastigiatum* (Nutt.). — Plate 39.

↔ ↔ Puberulent, at least in lines: seeds more fusiform, usually somewhat beaked above.

= Seeds papillate.

E. OREGANUM, Greene. — A couple of feet high, rather stout, simple or with ascending branches, glabrate and glaucous below, glandular-puberulent above; leaves ascending, as much as 75 mm. long, lanceolate, obtuse, closely denticulate, cuneately subsessile or abruptly rounded to short winged petioles, veiny; flowers rather numerous, erect in the axils of the reduced upper leaves; calyx-tube 3 mm. long, rather narrowly funnel-form; petals violet, 8 to 12 mm. long; style about equalling the corolla, pubescent near the apex and on the outside of the four widely divergent stigmatic lobes; capsules nearly erect, 40 mm. long, usually subsessile; seeds oblong-fusiform, obliquely pointed at base, very shortly pellucid-beaked, .25 x .75 to 1 mm.; coma white. — Pittonia, i. (1889), 225. — *E. glaucum*, Howell, List for 1887, p. 3, *not* Phil. & Hausskn. — Grant's Pass, Oregon (*Howell*, July 1887, distributed as nos. 699 and 1139). — Specimens distributed as no. 695 by Howell in the same year appear to be a slenderer form of the same, and in habit and innovations closely approach *E. glaberrimum*. Specimens of the typical numbers in Hb. Dept. Agr. have short sobols somewhat rosuliferous at end, but most of those that I have seen do not show the innovations. — Plate 40.

I cannot resist the impression that *E. Oreganum* is a hybrid of *glaberrimum*, the vegetative characters suggesting *adenocaulon* as a possible other parent.

32. E. HORNEMANNI, Reichenb. — Mostly a span or two high, ascending, unbranched, somewhat crisp-hairy in the inflorescence and along the decurrent lines, or slightly glandular at top, otherwise glabrate; leaves about 25 mm. long, subascending, elliptical-ovate, mostly very obtuse, nearly netire to remotely serrulate, the lower cuneately narrowed,

the upper usually abruptly rounded to the short petioles; flowers rather few, nearly erect; petals 5 to 8 mm. long, lilac to deep violet; capsules as much as 50 mm., slender, erect, on slender peduncles about equalling the gradually reduced subtending leaves; seeds rather abruptly short-appendaged, from nearly smooth to very rough, .3 to .4 x 1 mm.; coma somewhat dingy. — Icon. Crit. ii. (1824), 73; Haussknecht, Monogr. 174. — Mountains, British Columbia to California, Colorado, and Utah; also in Europe.— Specimens examined from various parts of British Columbia (*Macoun*), Washington (*Howell; Brandegee* 1882, no. 285), Oregon (*Hall*, 1871, no. 0), California (*Newberry; Brewer* 1860–62, no. 1417), Idaho (*Watson*, 1880, no. 146), the Yellowstone region (*Hayden; Tweedy* 1885, no. 519), Colorado (*Parry*, 1861, no. 121; *Vasey*, 1868, no. 187, — 188 an albino of the same; *Engelmann; Jones* 1878, no. 377; *Nuttall; Hall & Harbour* 1862, no. 167), and Utah (*Hooker & Gray*, 1877; *Jones* 1879, no. 1099 in part and 1103). — Plate 41.

The following variations from the western form occur: —

a.—Slender and low, with smaller elliptical spreading leaves, few suberect small flowers, short capsules, and small seeds. — Dells of the Wisconsin River (*Lapham*) to the Saguenay River (*Pringle*, 1879). — Apparently annual, in aspect very near the dwarf form mentioned under *adenocaulon*, and perhaps not rightly referred here. — Plate 42.

b. — From slender and low to quite stout, as much as a foot high, and few-branched, with ovate very divergent mostly long- and slender-stalked leaves, usually very nodding large flowers, and rather large very broad seeds.— White Mountains of New Hampshire to Labrador (*Allen*, 1882, no. 50) and westward, passing into the usual western form. — Plate 42.

In this species the sobols sometimes pass insensibly into leafy shoots arising above ground, showing the impossibility of maintaining a sharp distinction between the soboliferous and stoloniferous groups.

Specimens of the aspect of this species, but as much as a foot and a half high, and some of them branched above, with the flower buds 8 to 10 mm. and the violet petals 12 mm. long, and with deeply 4-lobed stigma, were collected on Mt. Stewart, Washington, by Mr. Brandegee (Aug. 1883, no. 778 in Hb. Gray., Hb. Canby., etc.). They appear to be hybrids of this species, but I do not venture to suggest the other parent.

= = Seeds smooth or merely areolate. — A single species of the habit of *Hornemanni*, but passing into the following group by its smooth seeds.

33. E. Bongardi, Hausskn. — A foot or less high, erect, simple, with crisp-hairy lines, the apex at first nodding; leaves 25 to 50 mm. long, rather ascending, crowded above, very broadly lanceolate, the upper acute, sharply but remotely denticulate, usually crisp-ciliate, gradually narrowed to the conspicuous cuneately winged base, veiny, drying brown; inflorescence sparingly glandular; flowers rather few, somewhat nodding; petals about 8 mm. long, pale or rosy; capsules rather slender, 40 mm. long, on slender peduncles much shorter than the leaves; seeds nearly beakless, .4 x 1.3 mm.; coma very dingy. — Oesterr. Bot. Zeitschr. xxix. (1879), 89; Monogr. 278. — Alaska and the adjacent islands. — Plate 43.

+++++ Often more or less cespitose by leafy stolons, otherwise simple or nearly so: sometimes apparently annual.

++ Seeds smooth or at most undulate-areolate except in forms referred to *Oregonense*.

= Habit of *E. Hornemanni*, with rather ample leaves.

34. E. Behringianum, Hausskn. — A span to nearly a foot high, sometimes with ascending branches from near the base, more or less nodding at apex, glabrous except for the shortly crisp-pubescent lines; leaves about 40 mm. long, mostly broadly ovate, subentire or the acutish upper ones slightly

denticulate and somewhat crisp-ciliate, all but the lowest abruptly contracted and sessile, subglaucous, less veiny, more rigid, and drying greener than in the last; flowers erect, rosy; seeds short-beaked. — Monogr. 277. — Coast and insular region from Alaska to N. E. Asia, according to Haussknecht, from whose description the characters are taken, as I have seen no specimens which I can clearly separate from the preceding species.

35. E. ALPINUM, L. — Size and habit of *E. Hornemanni*, but the inflorescence and decurrent lines more nearly glabrous; leaves uniformly distributed, thin and delicate, pale green, 40 mm. long, subelliptical, rather obtuse, subentire to somewhat sharply serrulate, gradually narrowed to slender petioles; flowers few, suberect in the upper axils; petals about 3 mm. long, white or rosy-tipped; capsules very slender, erect or ascending, about 50 mm. long, their peduncles rather slender and about equalling the subtending leaves or stouter and as long as the capsules; seeds smooth, gradually attenuated at apex, with very evident beak. — Sp. i. (1753), 348, in part. — *E. lactiflorum*, Haussknecht, Oesterr. Bot. Zeitschr. xxix. (1879), 89; Monogr. 158. — Canada to Vancouver Island, extending southward in the mountains to New Hampshire, Utah, and California(?); also in Europe. — Specimens examined from various parts of British America (*Macoun*), the White Mountains, Colorado (*Coulter*, 1873), Utah (*Watson*, 1869, no. 394 in part; *Porter*, 1873; *Jones*, 1879, no. 1099 in part), Washington (*Suksdorf*, 1881, no. 10), Oregon (*Howell*, 1880, no. 325; *Henderson*, 1890, no. 344), and California? (*Mrs. Austin; Palmer* 1888, nos. 218 and 219). — Occurring with *E. Hornemanni*, which it closely resembles except for its more delicate, pale leaves, smaller white flowers, and smooth seeds attenuated to the beak. — Plate 44.*

*The original *alpinum* of Linnæus included with this *E. Hornemanni* and *E. anagallidifolium*. The first-named was separated by Reichenbach in 1824; the second, by Lamarck in 1786. Although the name *alpinum* has been applied indiscriminately to all three by many writers, I do not

— — Habit of *E. anagallidifolium*, with narrow subentire leaves (these more toothed in *pseudo-scaposum*).

36. E. OREGONENSE, Hausskn. — A span high, with few sterile shoots at base, erect even as to the apex, glabrous except for very sparing glandular hairs in the inflorescence; leaves 15 to 20 mm. long, crowded below, remote and very small above, suberect, narrowly oblong-ovate or the uppermost linear, very obtuse, remotely low-denticulate, somewhat cuneately narrowed at base but sessile, rather delicate and with slightly evident lateral veins; flowers few, strictly erect; petals deep violet, about 8 mm. long; capsules about 50 mm., slender, strict, much surpassing the summit of the stem, their very slender peduncles of nearly equal length and far exceeding the subtending leaves; seeds (immature) smooth, blunt, apparently beakless. — Monogr. 276, pl. 14, f. 66. — Bogs, Oregon (*Hall*, 1871, no. 179) to British Columbia (Swamp River, *Macoun*, 1875, no. 1921 in part). — Plate 25.

Young Californian plants referred here with considerable doubt, have small but more ovate leaves drying brownish (*Bolander*, nos. 1786 and 4965; *Lemmon*, 1875 — the leaves in whorls of 3 in one specimen). Here also, perhaps, would be referred plants collected in Tulare county, California (*Palmer*, 1888, 218 in part, and 220). In the latter, especially, the internodes lengthen and the leaves are very narrow above, as in the type, but the lower leaves are short and ovate. Except for their larger size and more erect habit, however, these round-leaved plants are not unlike some of the more erect European forms of *anagallidifolium*, — *e. g.* a specimen from the Clova Mts., Scotland, collected by Greville in 1839.

Var. ? GRACILLIMUM. — A span to nearly a foot high, often quite cespitose, very slender, quickly erect and hardly

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think it best to follow Professor Haussknecht in adopting a new name for what is left of the original *alpinum*, but prefer still to employ for it the name given it by Linnæus. Nor should I follow H. and J. Groves in allowing the latest name, *lactiflorum*, to stand, while displacing *anagallidifolium*.

bent at top, glabrous except the very minutely and sparingly glandular inflorescence; leaves mostly uniformly distributed, gradually reduced above, suberect, shorter than the internodes, narrower, entire, keeled on the midrib, without evident lateral veins, the lowest or those on sterile shoots often cuneately subpetioled; flowers few, nearly erect; petals white or pale, 6 mm. long; seeds .3 x 1 mm., broadly and bluntly but evidently papillate, the beak scarcely hyaline. — Bogs, Strawberry Valley, California (*Pringle*, 1881, no. 80) to Washington (*Suksdorf*, 1878, 1885, and 1886 no. 860, — the former with broader, more veiny, and more crowded leaves, and occasional crisp pubescence on the stem). — Plate 46.

37. E. ANAGALLIDIFOLIUM, Lam. — About a span high, at length rather densely cespitose, otherwise unbranched, the very slender stems commonly sigmoidally bent, and strongly nodding at apex, somewhat crisp-hairy at least in lines and occasionally very slightly glandular in the inflorescence; leaves 10 to 20 mm. long, ascending, rather uniformly distributed, all but the lowermost very narrowly ovate or oblong, rather obtuse, entire or remotely very low denticulate, cuneately narrowed, the lowest mostly wing-petioled, rather firm and inconspicuously veined, drying brown; flowers few, crowded at apex, somewhat nodding; petals lilac to violet, about 5 mm. long; capsules 25 mm., slender, surpassing the end of the stem, their rather slender peduncles shorter than the leaves or, when only one or two are present, equalling the capsules; seeds somewhat obovoid-fusiform, short-beaked, .3 x 1 mm.; coma somewhat dingy. — Dict. ii. (1786), 376; Haussknecht, Monogr. 152. — From Labrador across Arctic America, south to the mountains of California (*Greene*, etc.), Colorado, and Nevada (*Watson*, 1868, no. 394 in part). Also in the Old World. — Plate 47.

Perhaps the lowest but slightly rough-seeded plants referred to the last belong here.

E. PSEUDO-SCAPOSUM, Hausskn. — About a span high from a filiform rooting rhizome, slender, erect from an ascending base, pubescent along the prominent decurrent lines; leaves about 12 mm. long, crowded, round-ovate, obtuse, subentire to sparingly angular-toothed, subsessile or on sterile shoots abruptly narrowed to short petioles, firm; flowers one or two, when solitary apparently terminal; capsules erect, 40 mm. long, on peduncles of equal length; seeds obovoid-oblong, shortly beaked, .3 x 1 mm.— Oesterr, Bot. Zeitschr. xxix. (1879), 89; Monogr. 278, pl. 13, f. 65. — Aleutian Islands (*Mertens*), *fide* Haussknecht, — hence likely to occur in Alaska, but unknown to me.

↔ ↔ Seeds often coarsely papillate, nearly one-half larger than in the preceding group.

38. E. CLAVATUM, n. sp. — A span high, mostly densely cespitose, the slender stems ascending, glabrate to sparingly glandular throughout; leaves 15 to 20 mm. long, divergent, broadly ovate, very obtuse, subentire to remotely serrulate, mostly rounded to evident petioles, firm, drying brownish; flowers rather few, suberect, petals rose-colored, about 5 mm. long; capsules 25 mm., subclavate, arcuately divergent, the lowest often not reaching the apex of the stem, their slender peduncles equalling the subtending leaves; seeds fusiform, tapering into a pale beak, nearly smooth to coarsely papillate, .4 to .6 x 1.5 to 2 mm.; coma barely dingy. — Washington and Oregon to Wyoming and Utah.— Specimens examined from Kicking Horse River, British America (*Macoun*, 1890), Mt. Adams, Washington (*Suksdorf*, 1877 and 1886), Oregon (*Cusick*, 1879, and 1880 no. 821; *Howell*, 1886, no. 595), the Cascade Mts. (*Tweedy*, 1882, no. 319), Wyoming (*Parry*, 1873, no. 110), and perhaps Utah (Uintas, *Watson*, 1869, no. 394 in part). — Plate 48.

Suggestive of a hybrid between *anagallidifolium* and *Hornemanni*, but with very much larger, abundant, and apparently good seeds.

EXPLANATION OF PLATES ILLUSTRATING THE NORTH AMERICAN SPECIES OF EPILOBIUM.

Plates 1 to 3 were drawn by Miss M. H. Hoke; the remainder, by Mrs. J. C. Duffey. Except where the contrary is stated, the figures are from herbarium specimens selected by the author and drawn under his supervision. Figures of seeds and stigmas are from drawings by the author. In all but one figure of seeds, the coma is omitted, for simplicity.

Plate 1, *E. spicatum*, Lam. — 1, Portion of plant, reduced one-half; 2, base of stem, showing the separated scales of the winter bud from which it developed, natural size; 3, longitudinal section of flower, enlarged; 4, cross section of ovary, and two ovules, — the coma removed from one of them, enlarged; 5, capsule, x 2; 6, portion of capsule, showing mode of dehiscence, enlarged; 7, seed, x 25. — Figs. 3, 4, and 6, after sketches by Sprague, in the Gray Herbarium.

Plate 2, *E. latifolium*, L. — 1, Portion of plant, reduced one-half; 2, base of stem, with scales and winter buds, natural size; 3, seed, x 25.

Plate 3, *E. hirsutum*, L. — 1, Plant, reduced one-half; 2, seed, and cross-section of same, x 25.

Plate 4, *E. luteum*, Pursh. — 1, Plant, reduced one-half; 2, leaf, natural size; 3, capsule, natural size; 4, stigma, x 12; 5, seed, x 25.

Plate 5, *E. rigidum*, Hausskn. — 1, Two plants, reduced one-half; 2, leaf, x 2; 3, young capsule, x 2; 4, stigma, x 12; 5, immature seed, x 25.

Plate 6, *E. obcordatum*, Gray. — 1, Plant, natural size; 2, stigma, x 12; 3, seed, x 25.

Plate 7, *E. suffruticosum*, Nutt. — 1, Plant, natural size; 2, capsule, x 2; 3, stigma, x 25; 4, seed, x 25.

Plate 8, *E. paniculatum*, Nutt. — 1, Plant, reduced one-

half; 2, a large flower, natural size; 3, capsule, x 2; 4, stigma, x 25; 5, seed, x 25.

Plate 9, *E. paniculatum*, Nutt., var. *jucundum*, (Gray). — 1, Plant, reduced one-half; 2, leaf, x 2; 3, capsule, x 2; 4, stigma, x 25; 5, seed, x 25.

Plate 10, *E. minutum*, Lindl. — 1, Rather large plant, reduced one-half; 2, leaf, x 2; 3, capsule, x 2; 4, stigma, x 25; 5, seed, x 25.

Plate 11, *E. strictum*, Muhl. — 1, Plant, reduced one-half; 2, leaf, x 2; 3, flowering and fruiting apex of stem, natural size; 4, stigma, x 25; 5, seed, x 25.

Plate 12, *E. lineare*, Muhl. — 1, small and little branched plant, reduced one-half; 2, three young bulblets, x 9; 3, leaf, x 2; 4, stigma, x 25; 5, seed, x 25. — The bulblets become at length narrowly ovoid, and 12 mm. or more long.

Plate 13, *E. palustre*, L. — 1, Plant of the usual Rocky Mountain form, reduced one-half; 2, leaf, x 2; 3, bulbiferous subterranean shoot, natural size; 4, stigma, x 25; 5, seed, x 25; 6, plant of the forma *Labradorica*, natural size; 7, leaf of same, x 2.

Plate 14, *E. Davuricum*, Fisch. — 1, Fruiting plant from the Rocky Mountains, natural size; 2, flowering specimen from Norway, natural size; 3, rosettes at base of stem, x 2; 4, leaf, x 2; 5, nodding apex of flowering plant, natural size; 6, stigma (from Norwegian plant), x 25; 7, seed (from Rocky Mountain plant), x 25.

Plate 15, *E. Franciscanum*, Barbey. — 1, Portion of large plant, reduced one-half; 2, stigma, x 25; 3, seed, x 25.

Plate 16, *E. Watsoni*, Barbey. — 1, Plant with small innovations, reduced one-half; 2, stigma, x 25; 3, seed, x 25.

Plate 17, *E. holosericeum*, n. sp. — 1, Portions of plant, reduced one-half; 2, capsule, natural size; 3, stigma, x 25; 4, seed, x 25.

Plate 18, *E. Fendleri*, Hausskn. — 1, Portion of plant, reduced one-half; 2, stigma, x 25; 3, seed, x 25.

Plate 19, *E. coloratum*, Muhl. — 1, Plant, reduced one-half; 2, capsule, x 2; 3, stigma, x 25; 4, seed, x 25.

Plate 20, *E. Novo-Mexicanum*, Hausskn. — 1, Plant, reduced one-half; 2, stigma, x 25; 3, seed, x 25.

Plate 21, *E. adenocaulon*, Hausskn. — 1, Medium-sized plant, reduced one-half; 2, rosuliferous base of same, natural size; 3, stigma, x 25; 4, seed, x 25.

Plate 22, *E. adenocaulon*, Hausskn. (?) — dwarf form which may possibly be the *E. ciliatum* of Rafinesque. — Three plants, natural size; seed, x 25.

Plate 23, *E. adenocaulon*, Hausskn., var. *occidentale*. — 1, Plant, reduced one-half; 2, stigma, x 25; 3, seed, x 25.

Plate 24, *E. exaltatum*, Drew. — 1, Portions of plant with rosuliferous base, reduced one-half; 2, base of another plant with fleshy-scaled autumnal shoot, reduced one-half; 3, stigma, x 25; 4, seed, x 25.

Plate 25, *E. adenocaulon*, Hausskn., var. (?) *perplexans*. — 1, Plant, reduced one-half; 2, two young autumnal rosettes, x 2; 3, seed, x 25.

Plate 26, *E. Californicum*, Hausskn. — 1, Portion of plant, reduced one-half; 2, opening flower-bud, x 2; 3, seed, x 25.

Plate 27, *E. Parishii*, Trel. — 1, Young autumnal plant with rosettes, reduced one-half; 2, a rooted innovation, natural size; 3, stigma, x 25; 4, seed, x 25.

Plate 28, *E. delicatum*, n. sp. — 1, Plant, reduced one-half; 2, young seed, x 25. — 3, Var. *tenue*, reduced one-half; 4, two turions of same, natural size; 5, stigma of same, x 25.

Plate 29, *E. glandulosum*, Lehm. — 1–2, Flowering and fruiting summits of plants, reduced one-half; 3, stigma, x 25; 4, seed, x 25.

Plate 30, *E. brevistylum*, Barbey. — 1, Plant, reduced one-half; 2, base of stem at end of season, showing old and newly-formed turions, natural size; 3, flowering and fruiting summit of plant, natural size, — one flower showing a

rather frequent form of monstrosity; 4, stigma, x 25; 5, seed, x 25.

Plate 31, *E. ursinum*, Parish. — 1, Plant, reduced one-half; 2, portion of stem and leaves, x 2; 3, base of stem with turion, x 2; 4, stigma, x 25; 5, seed, x 25.

Plate 32, *E. ursinum*, Parish, var. *subfalcatum*. — 1 to 2, Two plants, natural size; 3, portion of stem and leaves, x 2; 4, seed, x 25.

Plate 33, *E. Halleanum*, Hausskn. — 1, Plant, reduced one-half; 2, flowering apex, natural size; 3, base of stem, with turions, x 2; 4, stigma, x 25; 5, seed, x 25.

Plate 34, *E. Drummondii*, Hausskn. — 1, Upper portion of more typical slender plant, reduced one-half; 2, stalked turion, x 2; 3, leaf, x 2; 4, stigma, x 25; 5, seed, x 25; 6, smaller plant, approaching *E. saximontanum*, reduced one-half.

Plate 35, *E. saximontanum*, Hausskn. — 1, Two plants of the more typical form, natural size; 2, turion, natural size; 3, seed, x 25; 4, broader-leaved form, approaching *E. Drummondii*, natural size.

Plate 36, *E. leptocarpum*, Hausskn. — 1, Plant, natural size; 2, leaf, x 2; 3, petal, x 12; 4, stigma, x 25; 5, seed, x 25.

Plate 37, *E. leptocarpum*, Hausskn., var. (?) *Macounii*. — 1, Large plant, natural size, — the old turion at base, also, x 2; 2, small plant with young turion, natural size, — the latter, also, x 2; 3, seed, x 25.

Plate 38, *E. glaberrimum*, Barbey. — 1, Plant, reduced one-half; 2, stigma, x 25; 3, seed, x 25.

Plate 39, *E. glaberrimum*, Barbey, var. *latifolium*, Barbey. — 1, Two plants, reduced one-half; 2, stigma, x 25; 3, seed, x 25.

Plate 40, *E. Oreganum*, Greene. — 1, Portion of plant, reduced one-half; 2, stigma, x 25; 3, seed, x 25.

Plate 41, *E. Hornemanni*, Reichenb. — 1, Two plants of the more typical Rocky Mountain form, natural size; 2, innovation, x 2; 3, seed, x 25.

Plate 42, *E. Hornemanni*, Reichenb. — 1, Large form of the White Mountains, natural size; 2, stigma of same, x 25; 3, seed of same, x 25.—4, Two plants of dwarf form of the Northeast questionably referred here, natural size; 5, seed of same, x 25.

Plate 43, *E. Bongardi*, Hausskn. — 1, Two plants, natural size; 2, stigma, x 25; 3, seed, x 25.

Plate 44, *E. alpinum*, L. (*E. lactiflorum*, Hausskn). — 1, Three plants, natural size; 2, innovations, x 2; 3, stigma, x 25; 4, seed, x 25.

Plate 45, *E. Oregonense*, Hausskn. — 1, Three plants, natural size; 2, leaf, x 2; 3, stigma, x 25; 4, seed, x 25; 5, fragment of specimen doubtfully referred here, with leaves in threes, x 2.

Plate 46, *E. Oregonense*, Hausskn., var. (?) *gracillimum*.— 1, Two plants, natural size; 2, stigma, x 25; 3, seed, x 25; — 4, nodding specimen of Suksdorf, doubtfully referred here but perhaps belonging to the next, natural size.

Plate 47, *E. anagallidifolium*, Lam. — 1, Three plants, natural size; 2, unusually erect plant, natural size; 3, exceptionally toothed leaf, x 2; 4, capsule, natural size; 5 stigma, x 25; 6, seed, x 25.

Plate 48, *E. clavatum*, n. sp. — 1, Plants, natural size; 2, rougher form of seed, x 25; 3, smoother form of seed, x 25.

Since the preceding pages were in print, I have discovered that the plant which here appears as *E. Oregonense*, var. (?) *gracillimum*, has been published by Professor Haussknecht in Mittheil. Geogr. Gesellsch. zu Jena, 1888, vii. 5,—*fide* Just, Jahresb. xvi (2), 156—, as *E. Pringleanum*, Hausskn, so that it should bear this name.

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Synonymes in parentheses.

adenocaulon, 91, 93, 94, 98, 105, 106.
adnatum, 92.
affine, (100, 105).
alpinum, 108.
Americanum, (94).
anagallidifolium, (89, 108, 109), 110, 111.
angustifolium, (80).
Behringianum, 107.
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spicatum, 80.
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suffruticosum, 84.
tenellum, (94).
tetragonum, (92, 94).
ursinum, 100.
Watsoni, 91.

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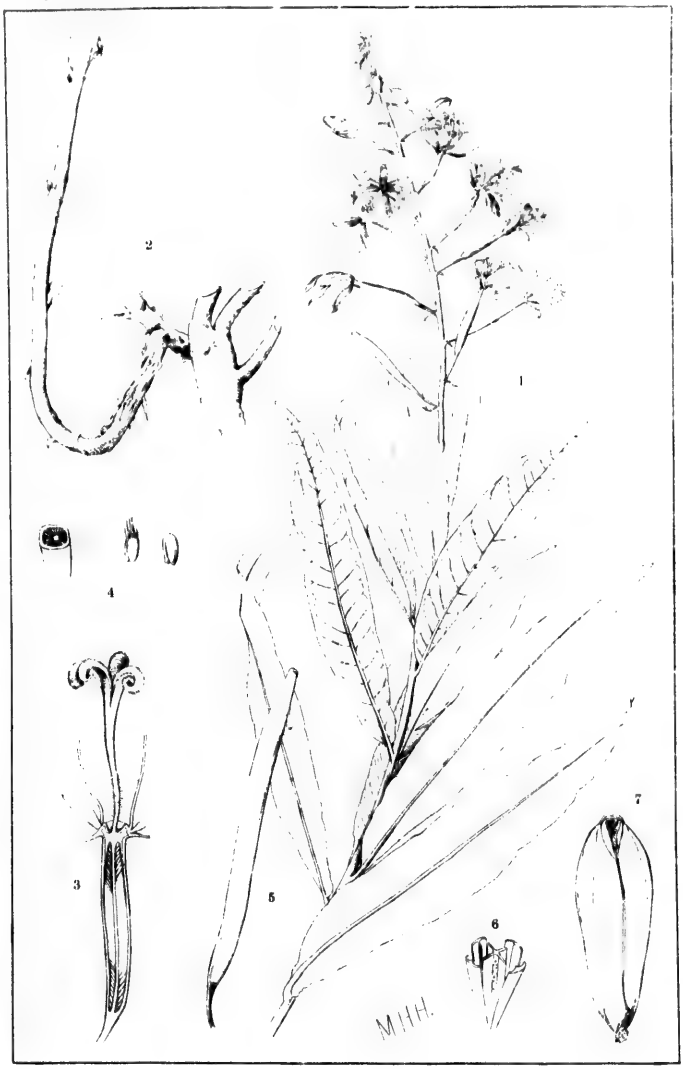

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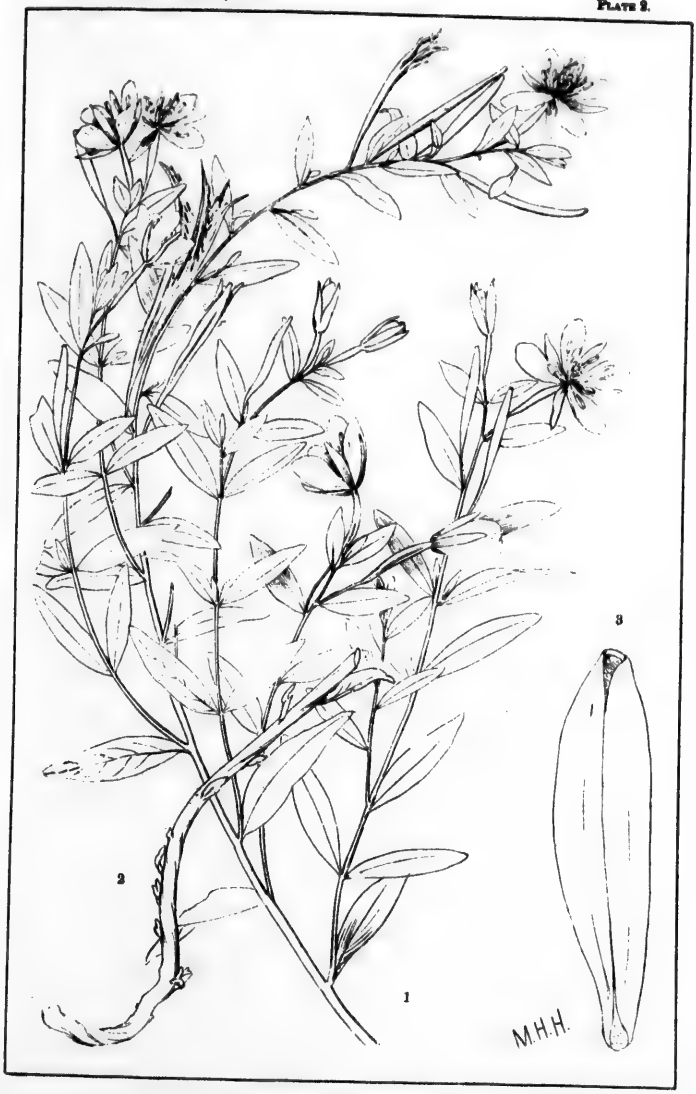

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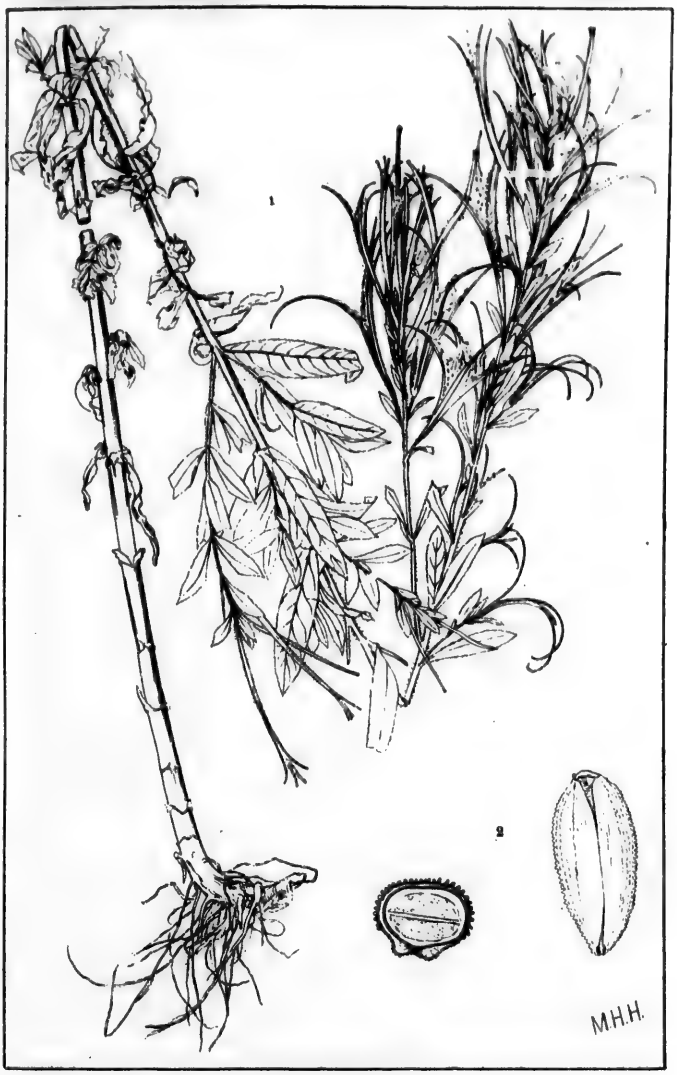

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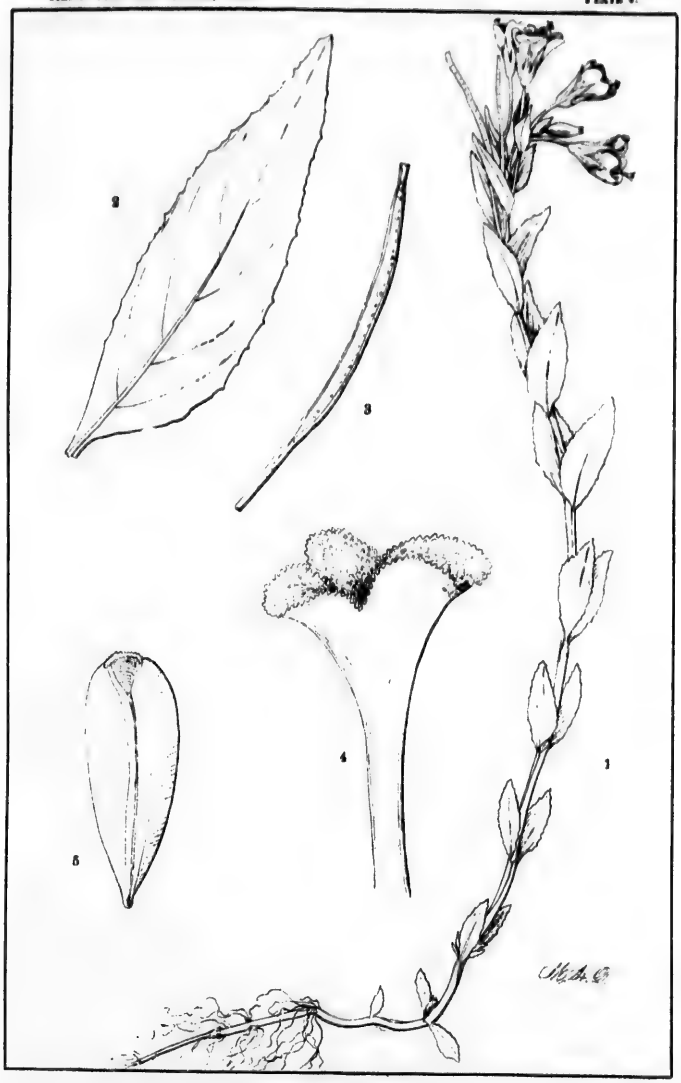
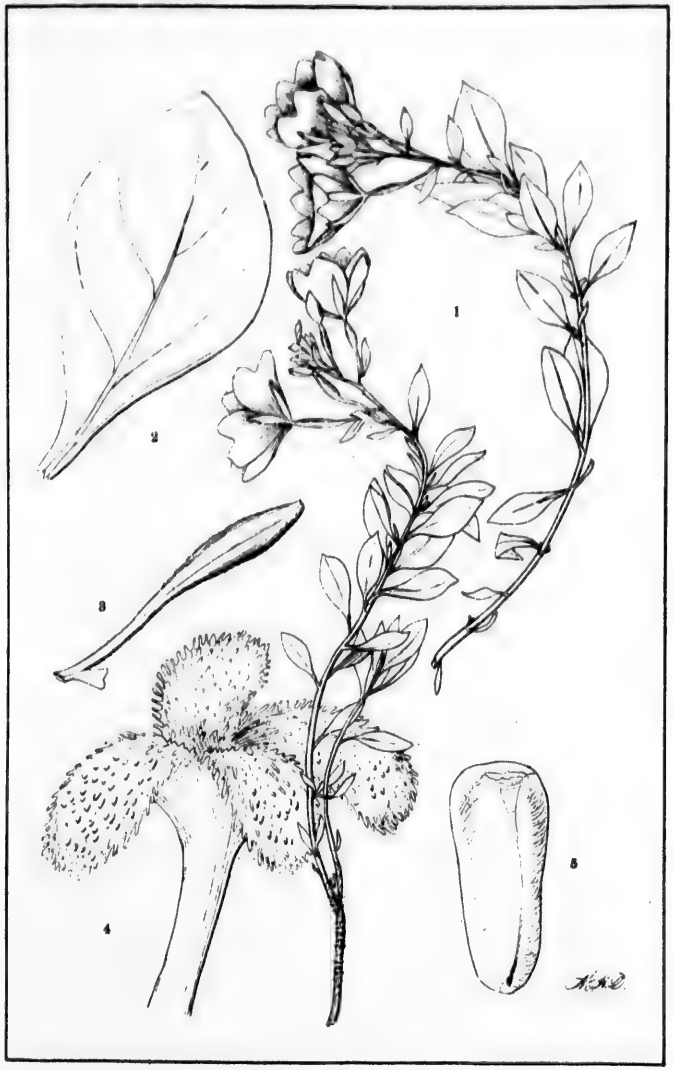
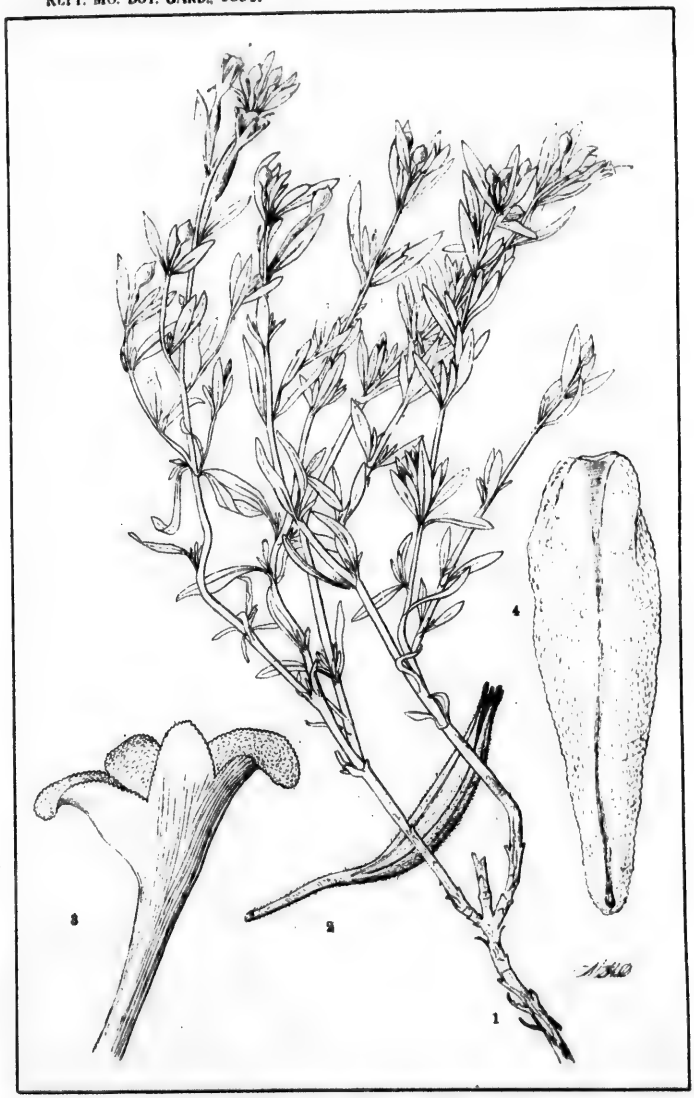


EPILOBIUM LUTEUM.



EPILOBIUM RIGIDUM.

EPILOBIUM OBCORDATUM.



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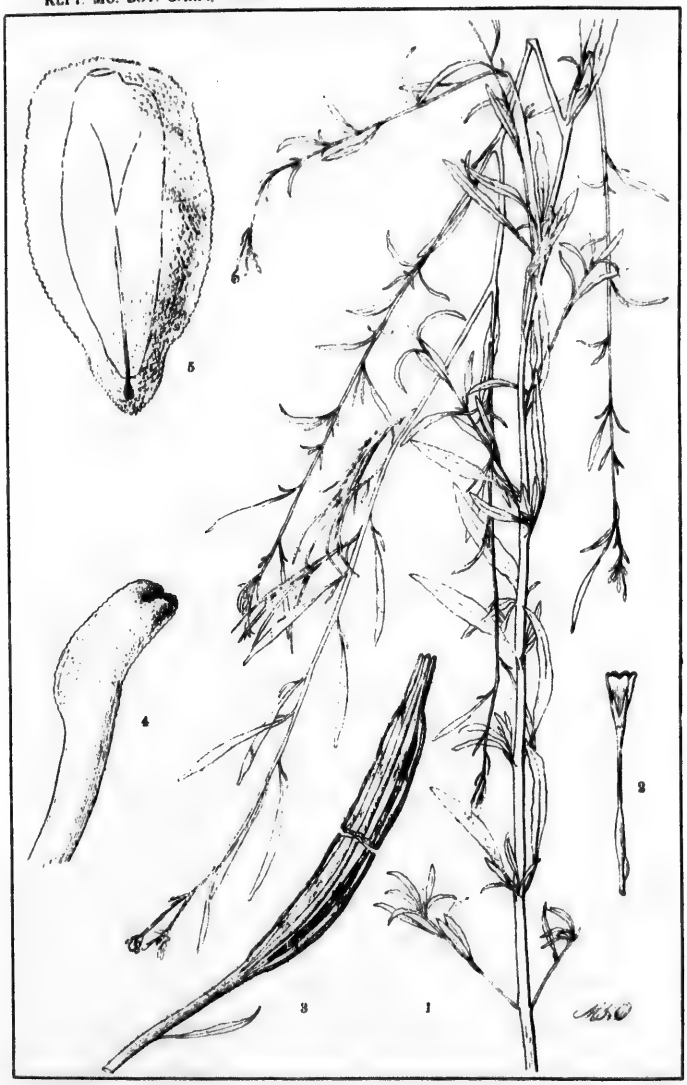

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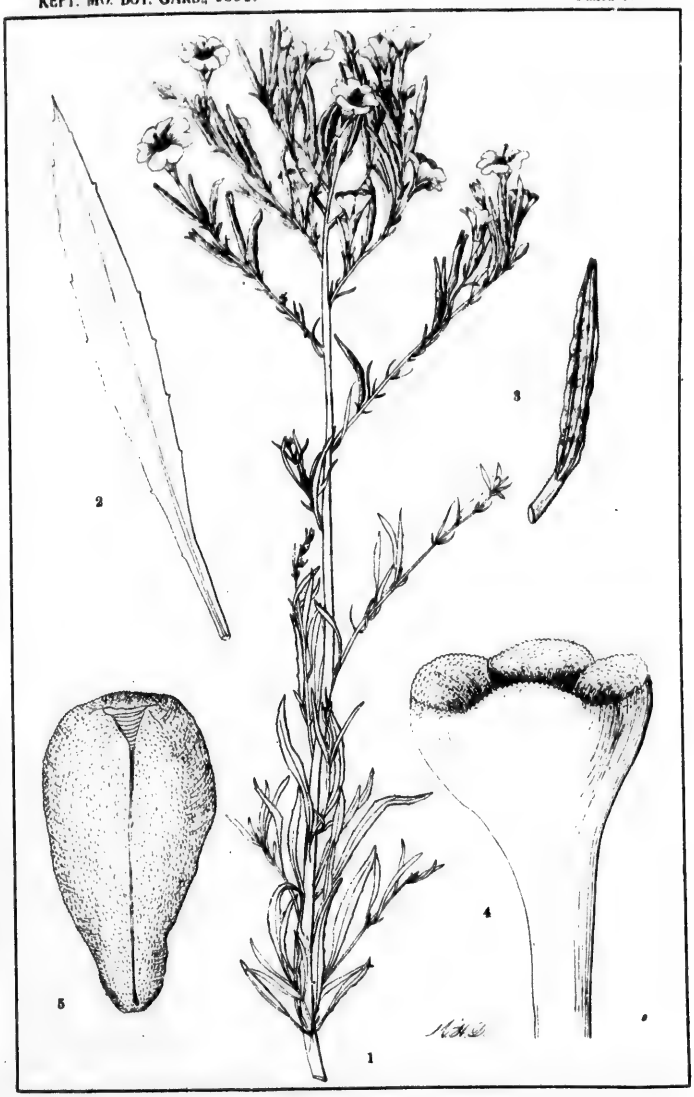

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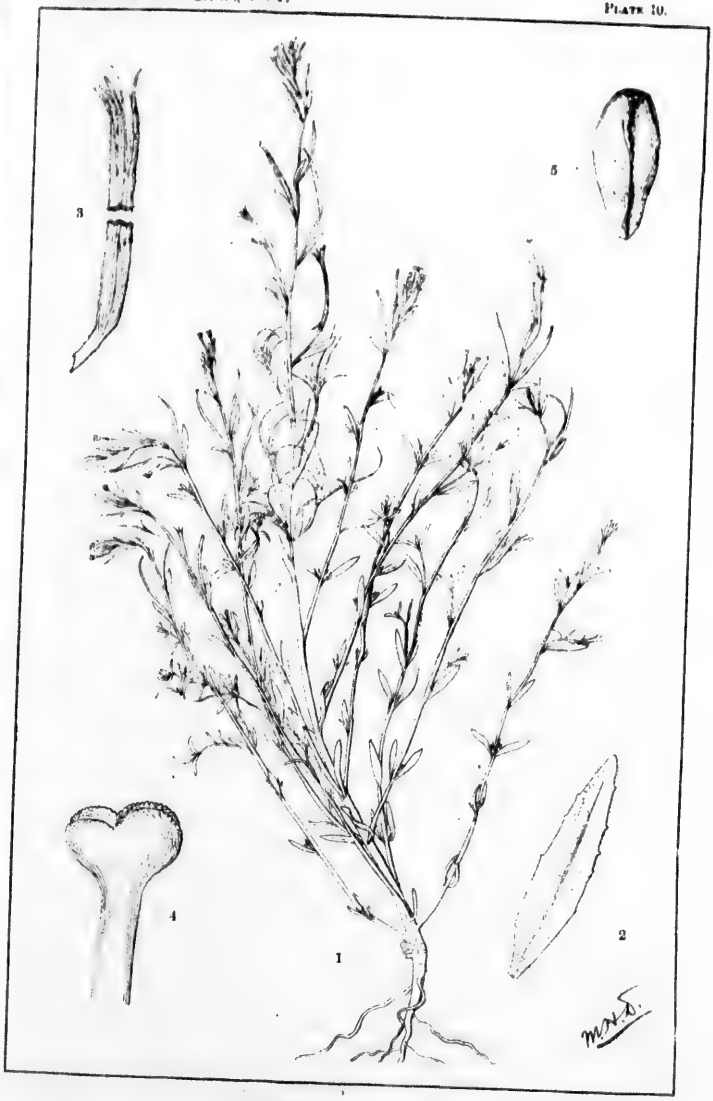

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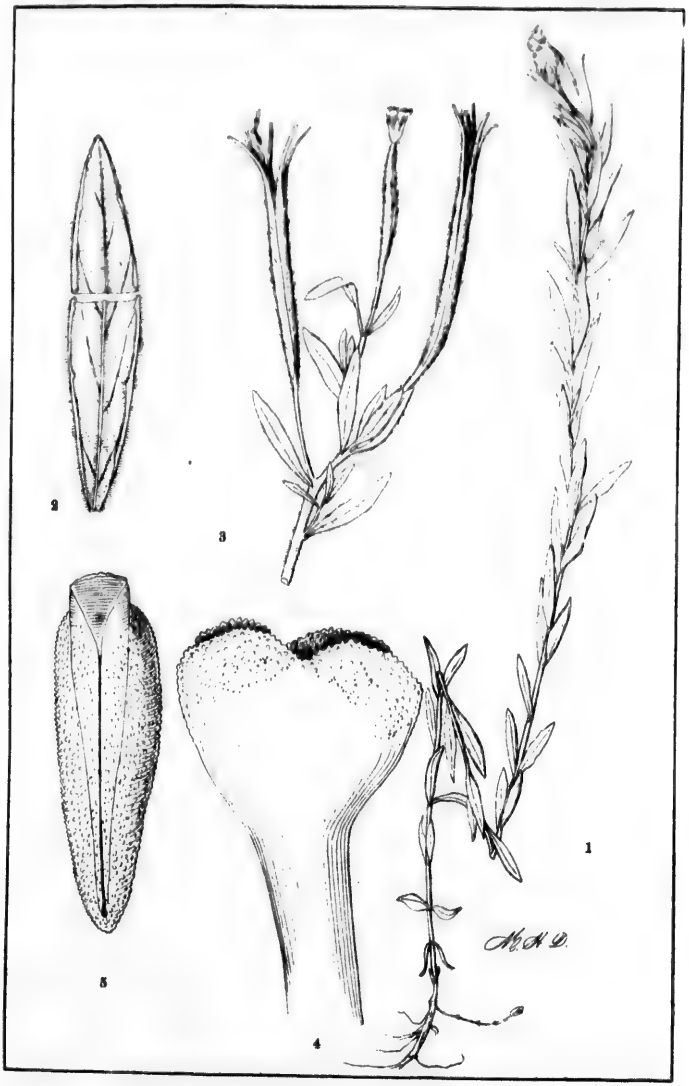

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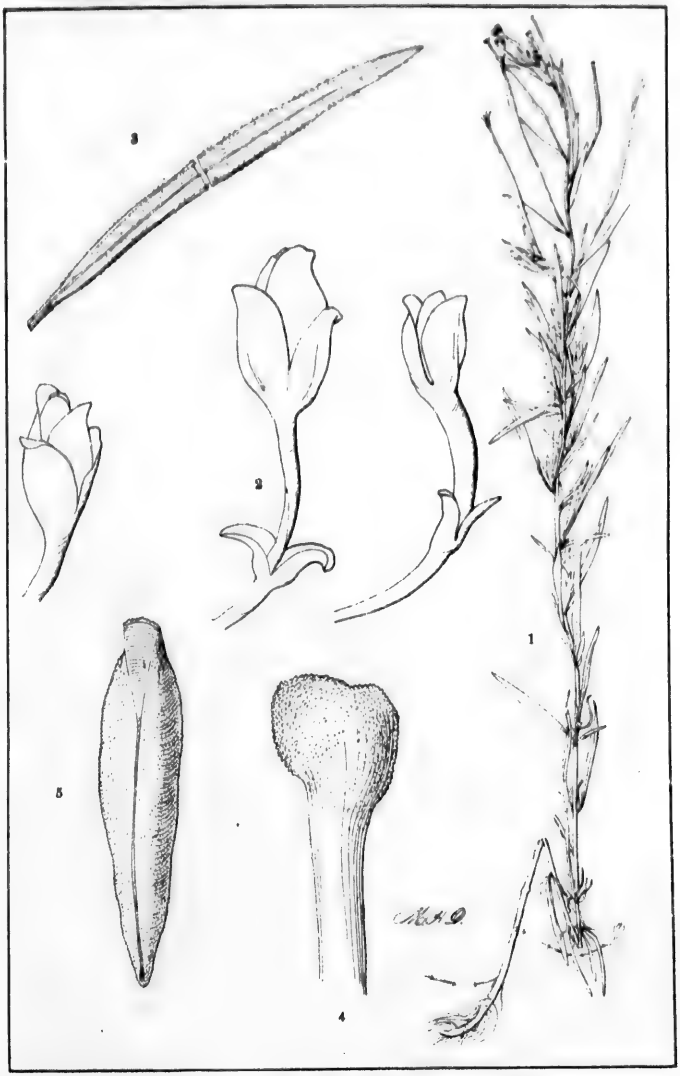

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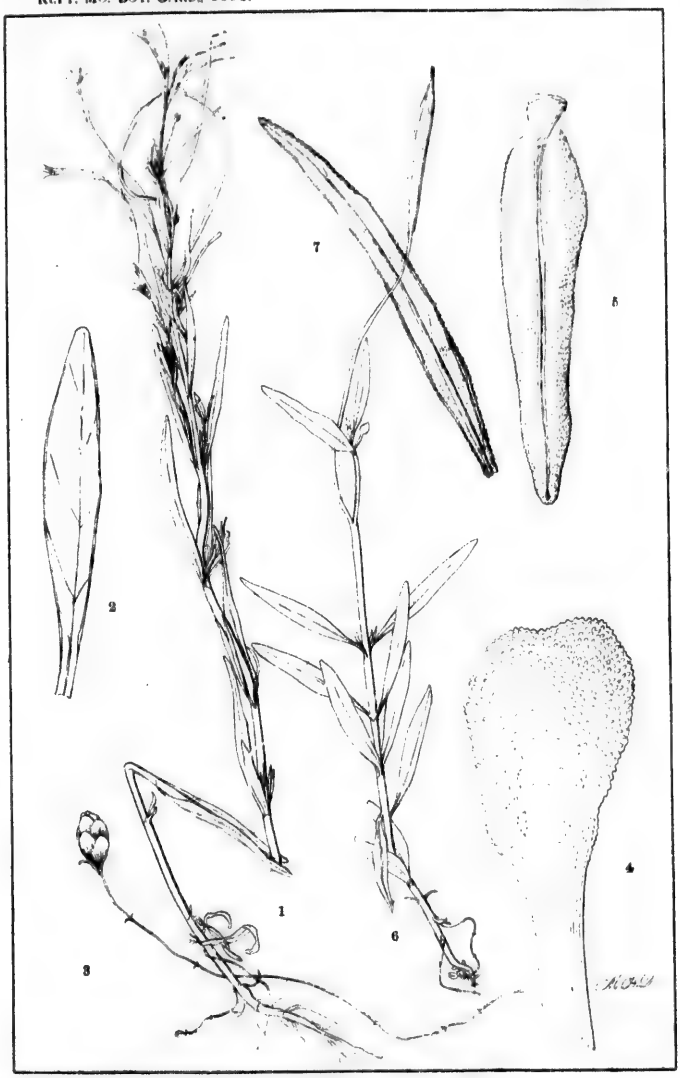

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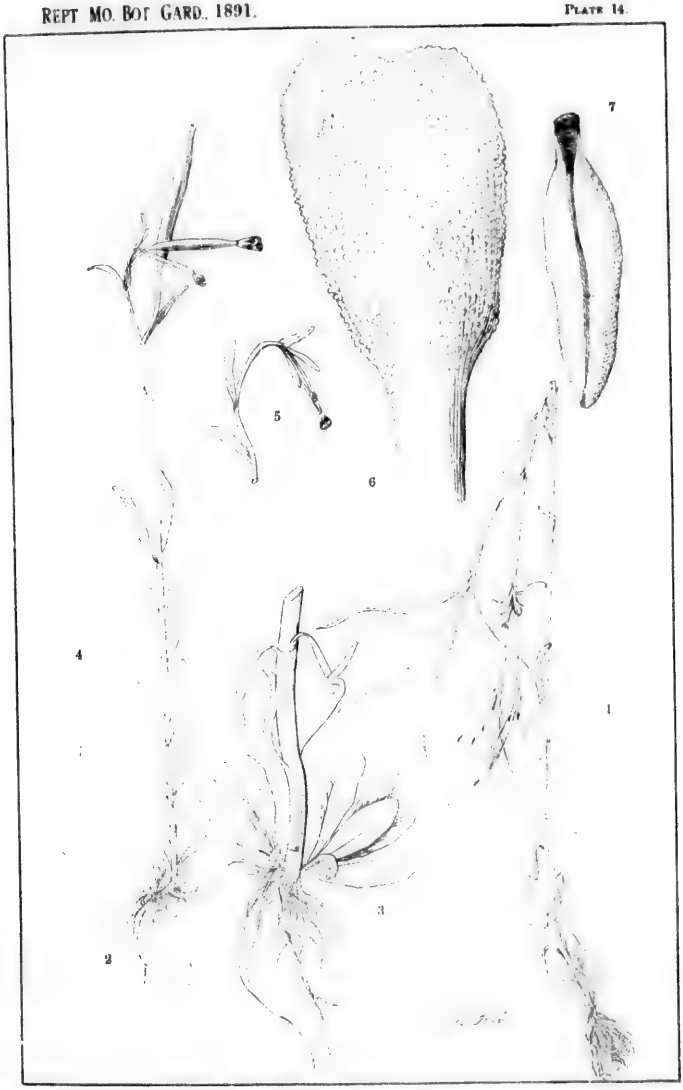
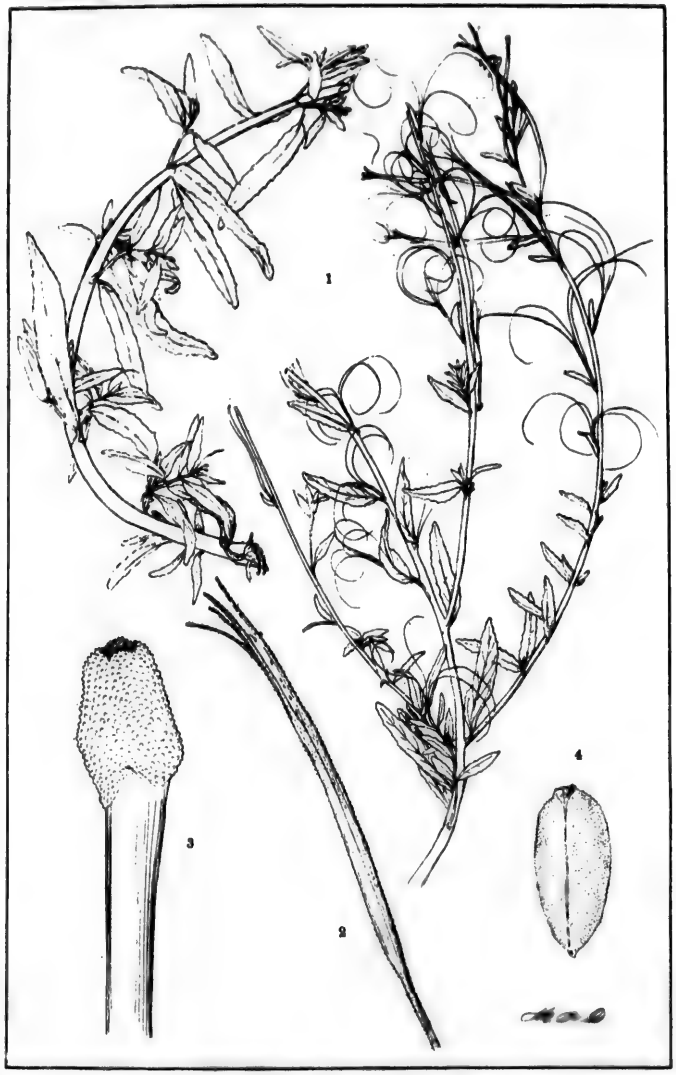


EPILOBIUM DAVURICUM.

EPILOBIUM FRANCISCANUM.

EPILOBIUM WATSONI.



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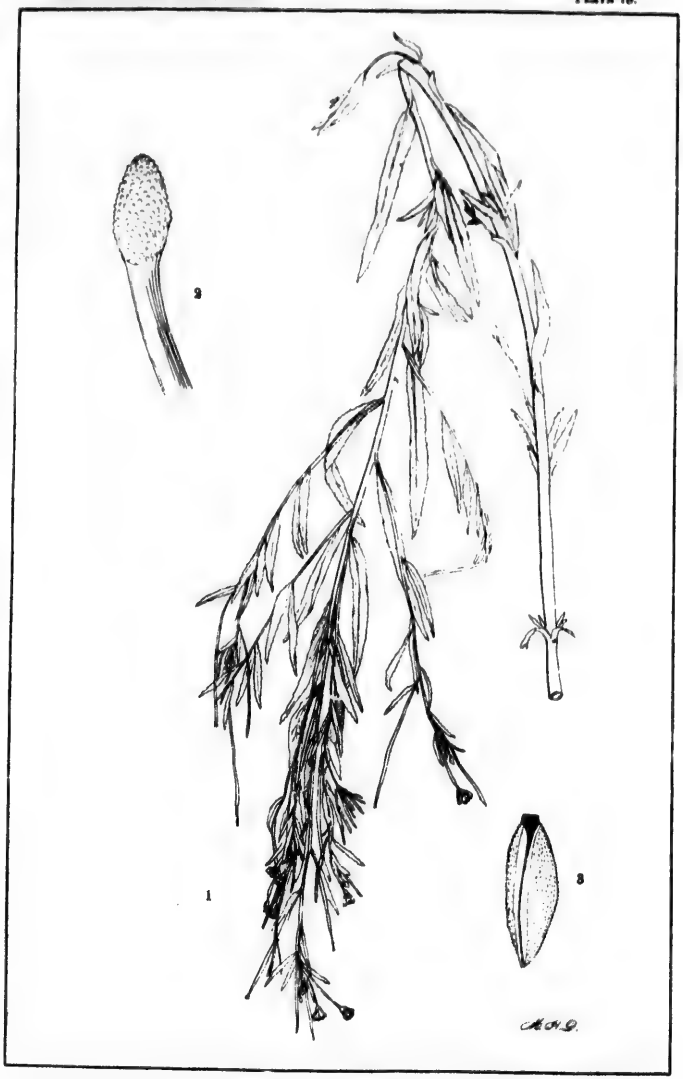

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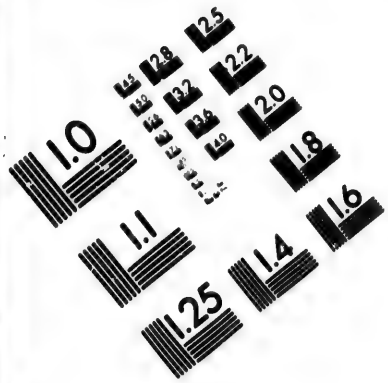
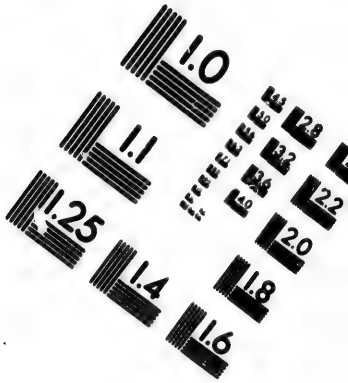




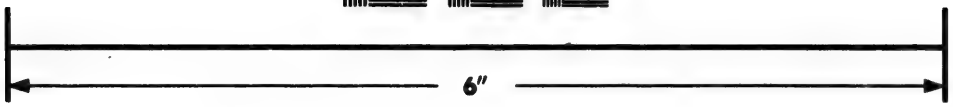


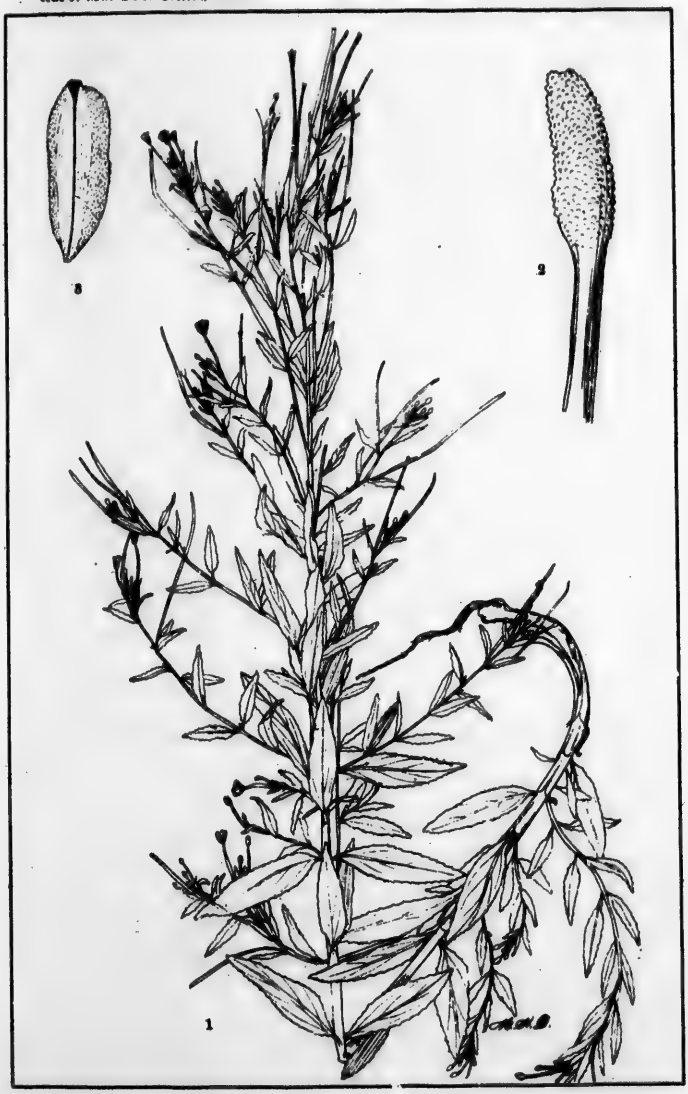
IMAGE EVALUATION
TEST TARGET (MT-3)

6"

Photographic
Sciences
Corporation

23 WEST MAIN STREET
WEBSTER, N.Y. 14580
(716) 872-4503

EPILOBIUM COLORATUM.



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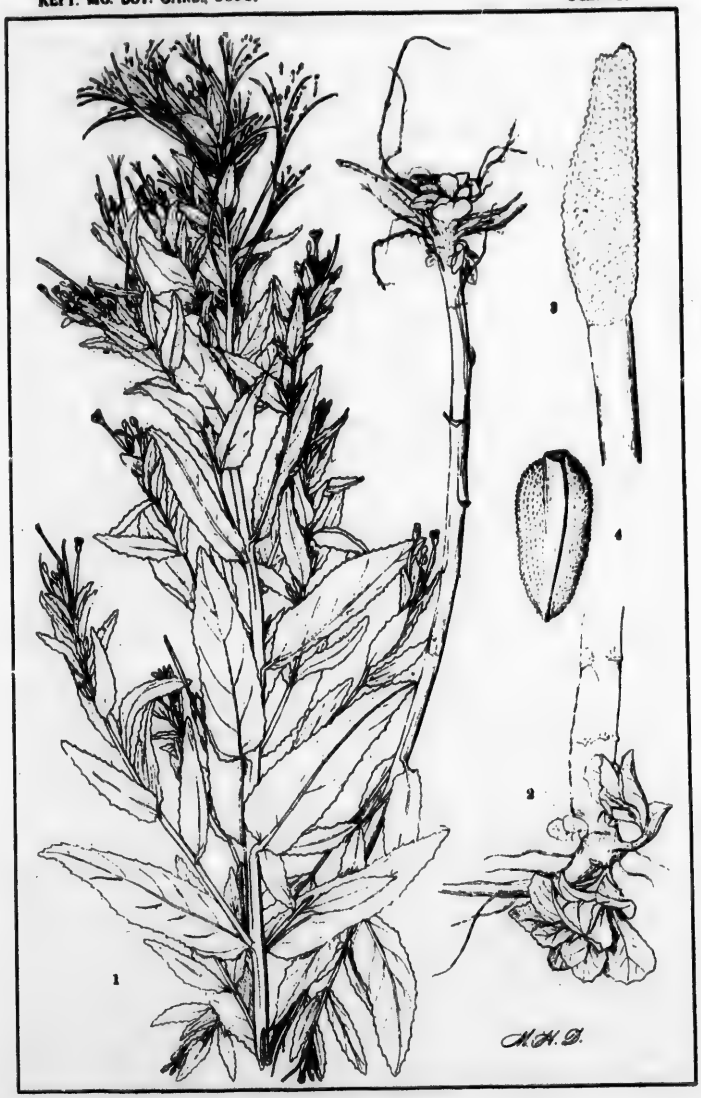
EPILOBIUM NOVO-MEXICANUM.



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EPILOBIUM ADENOCAULON.

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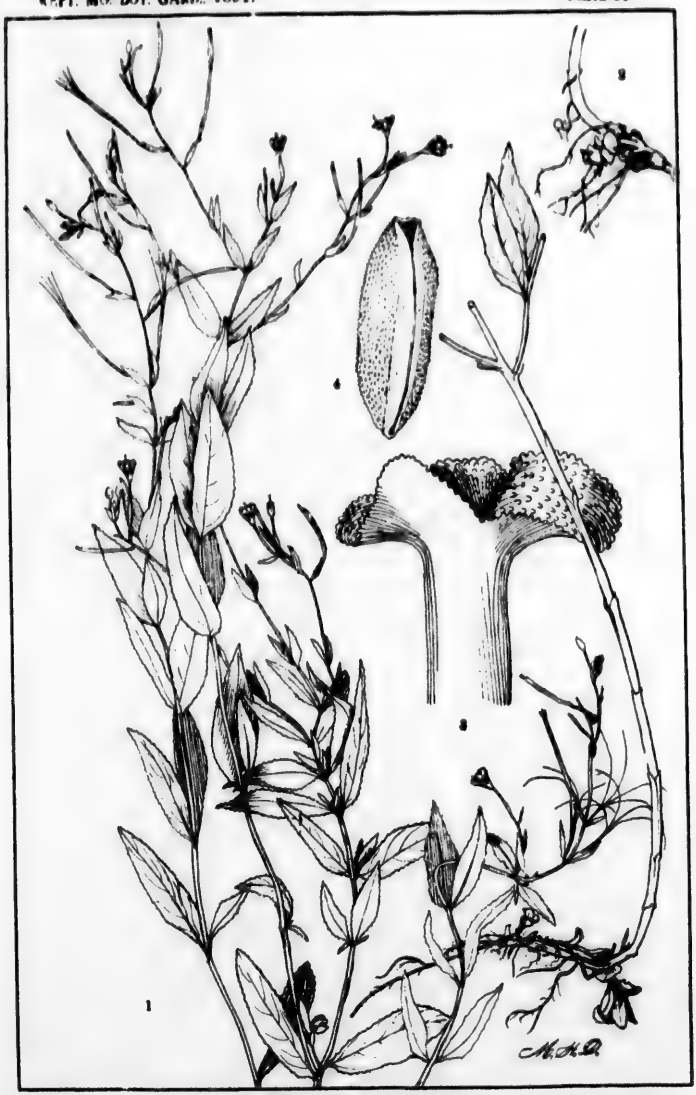
EPILOBIUM ADENOCAULON, var. OCCIDENTALE.



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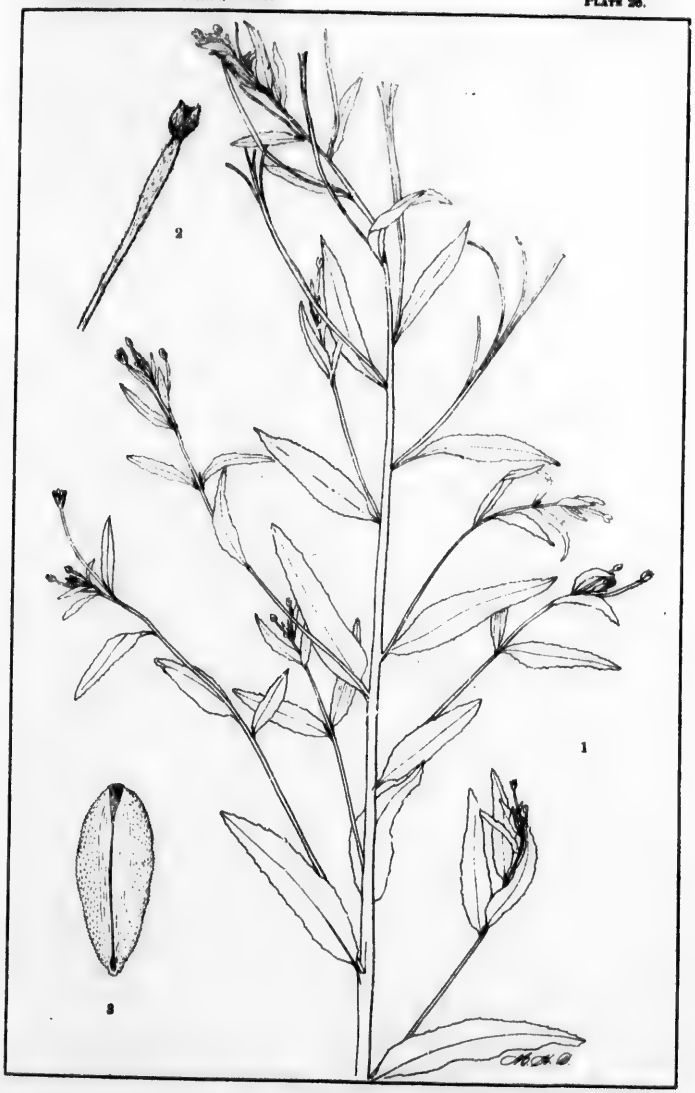

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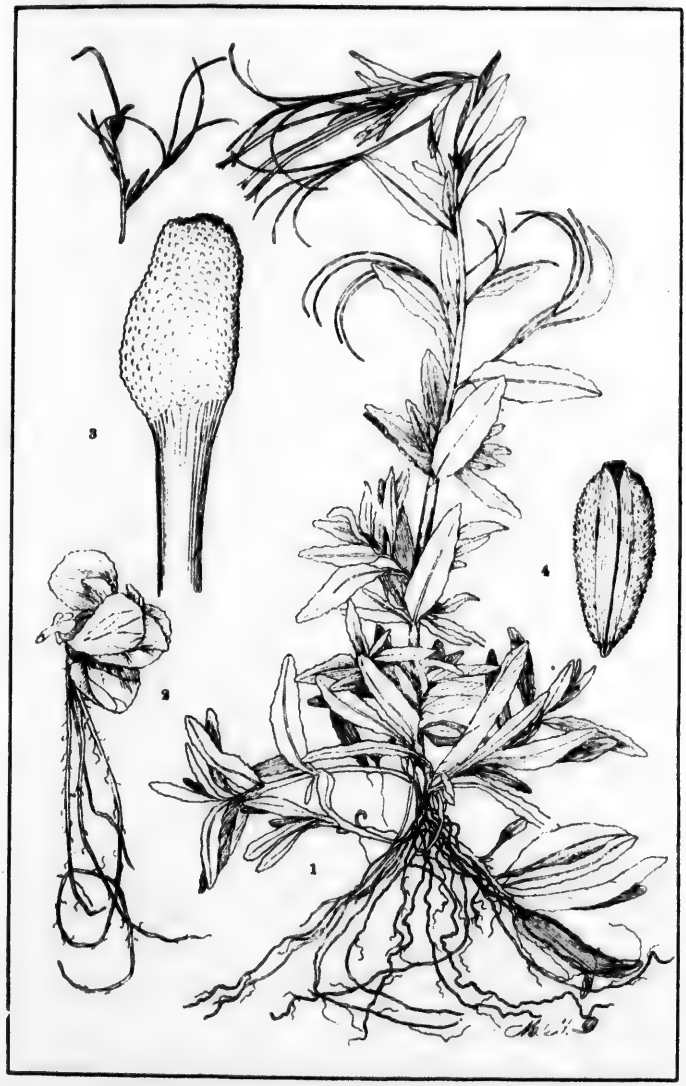

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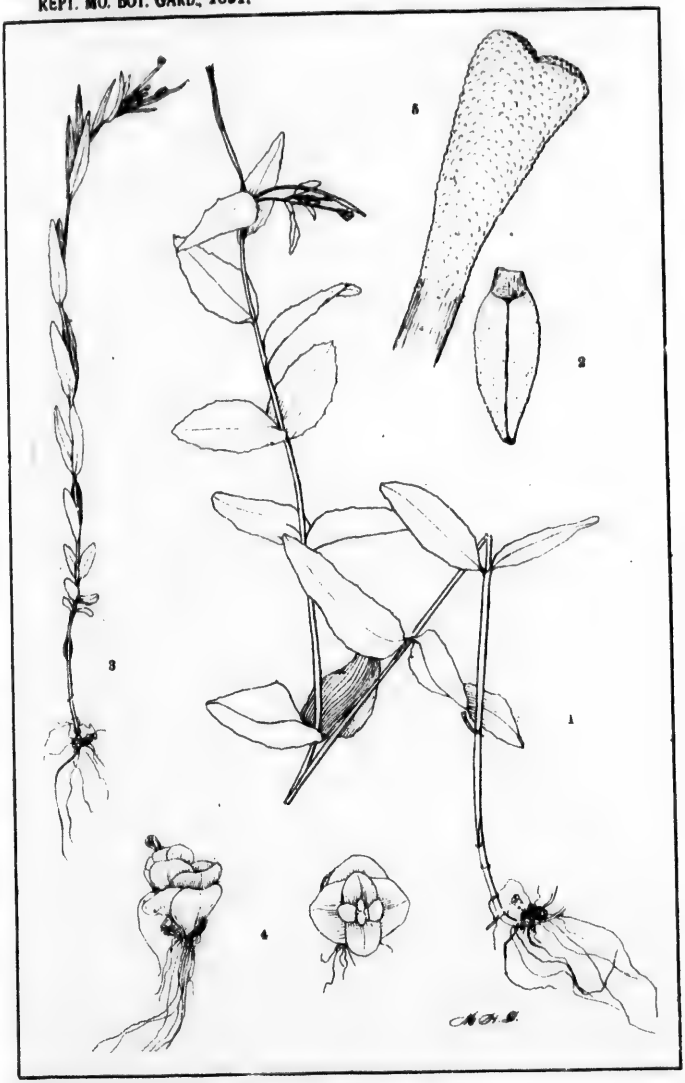

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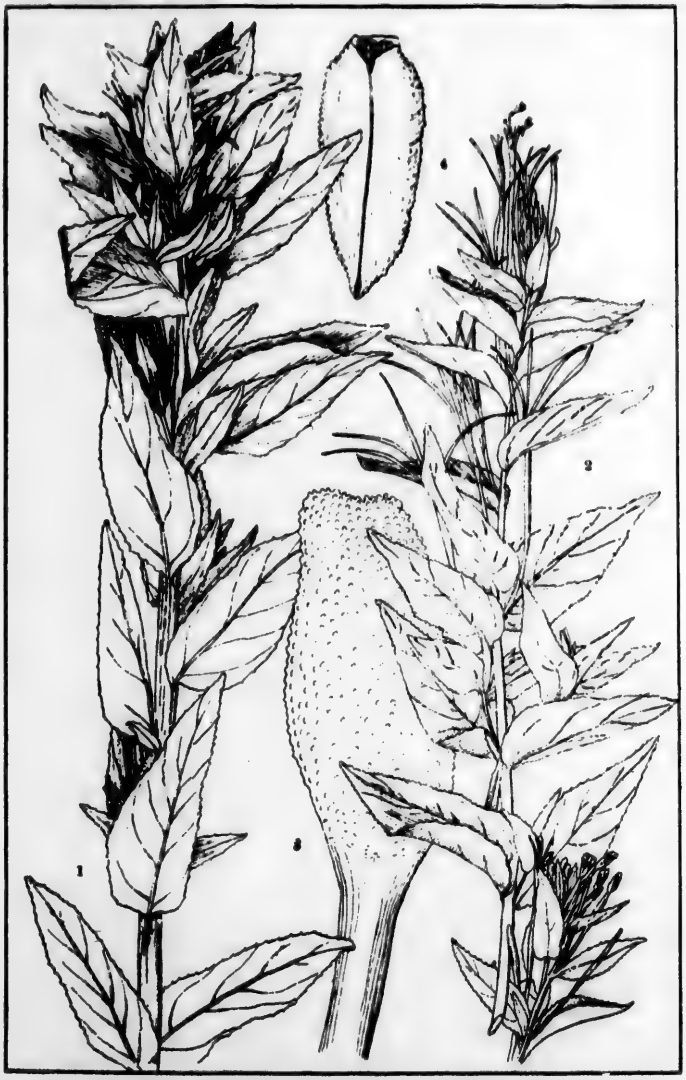

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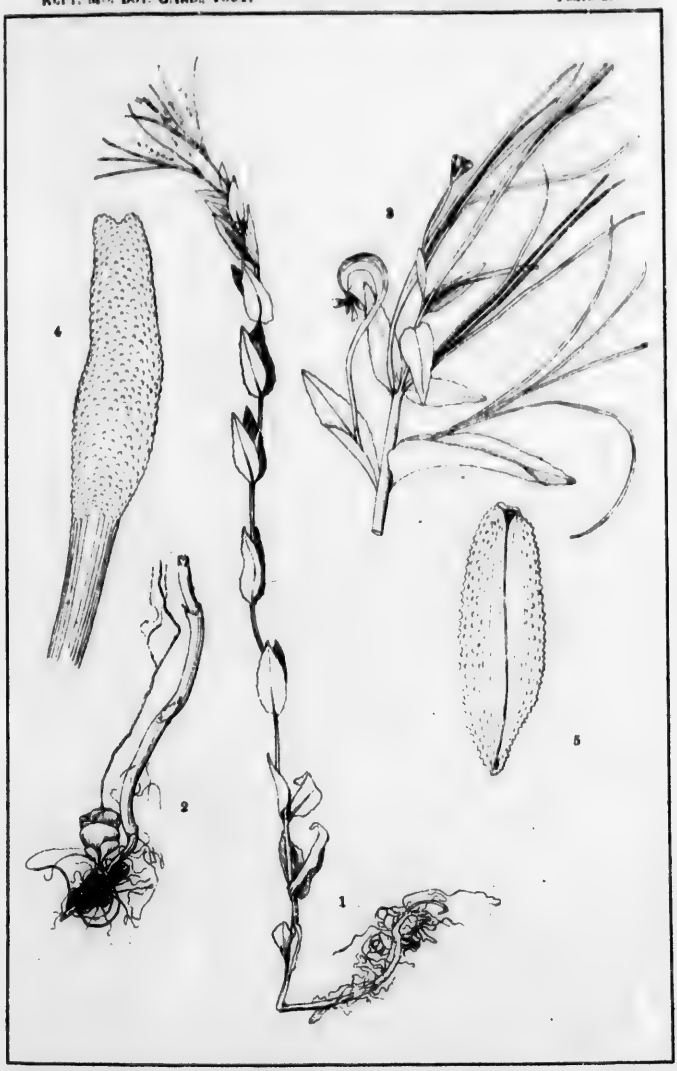

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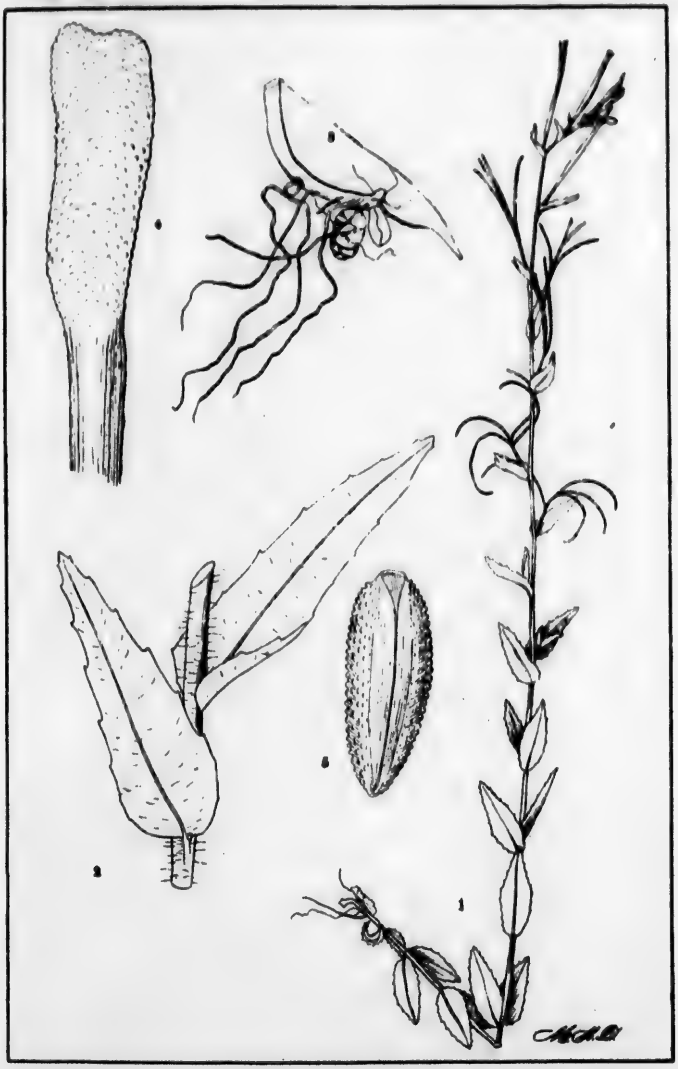

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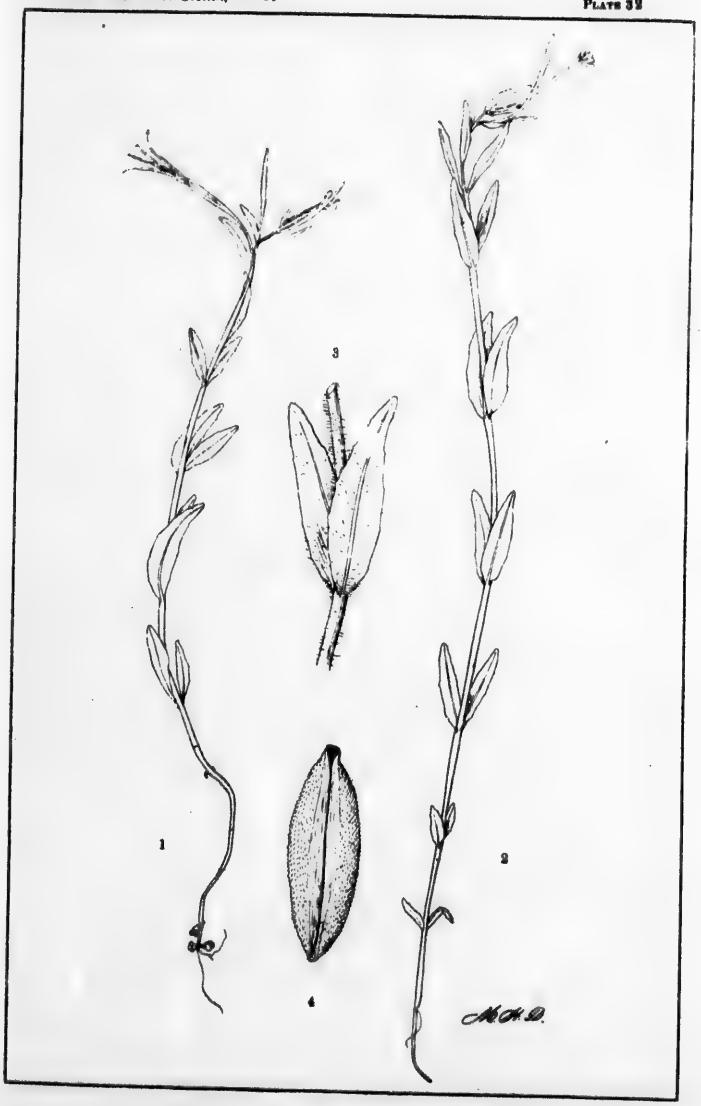

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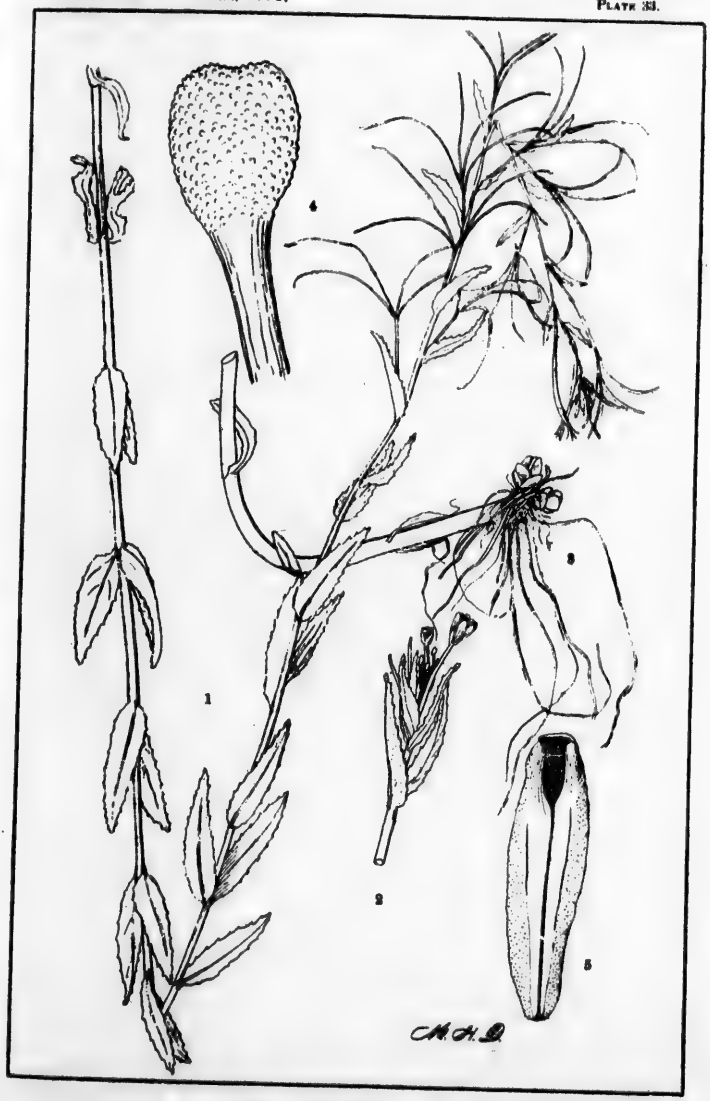

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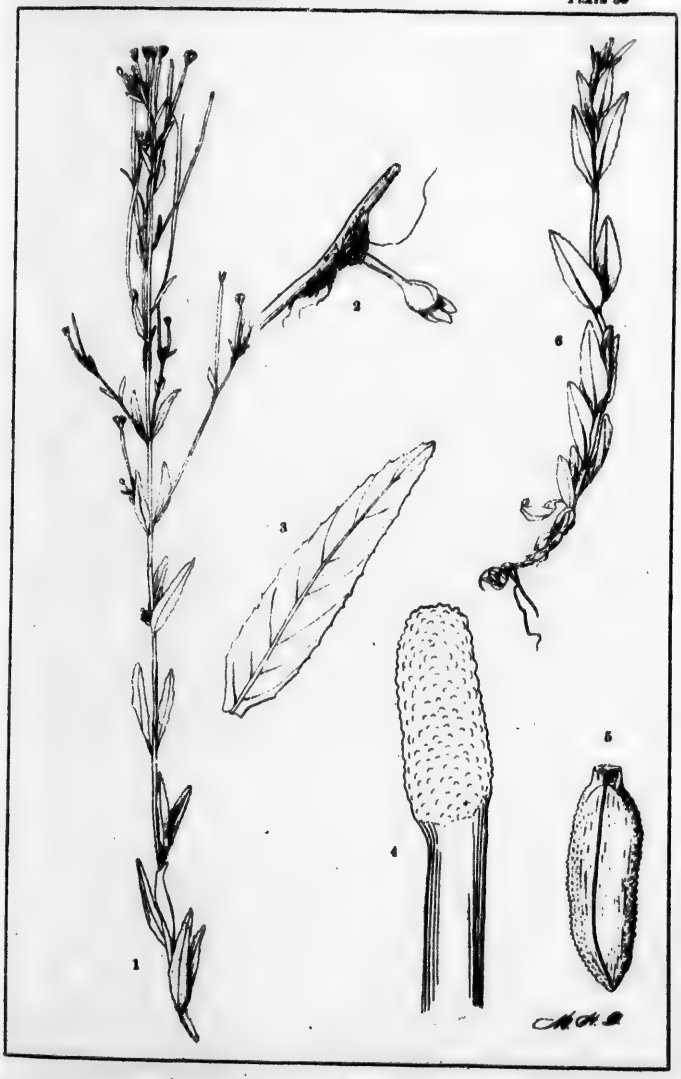

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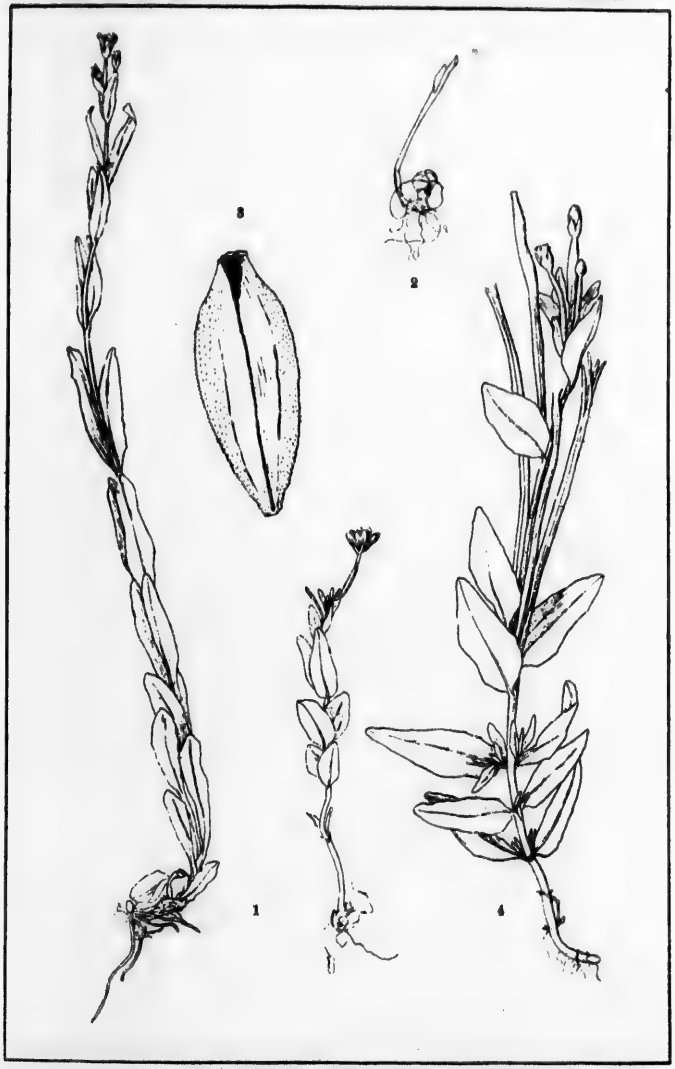

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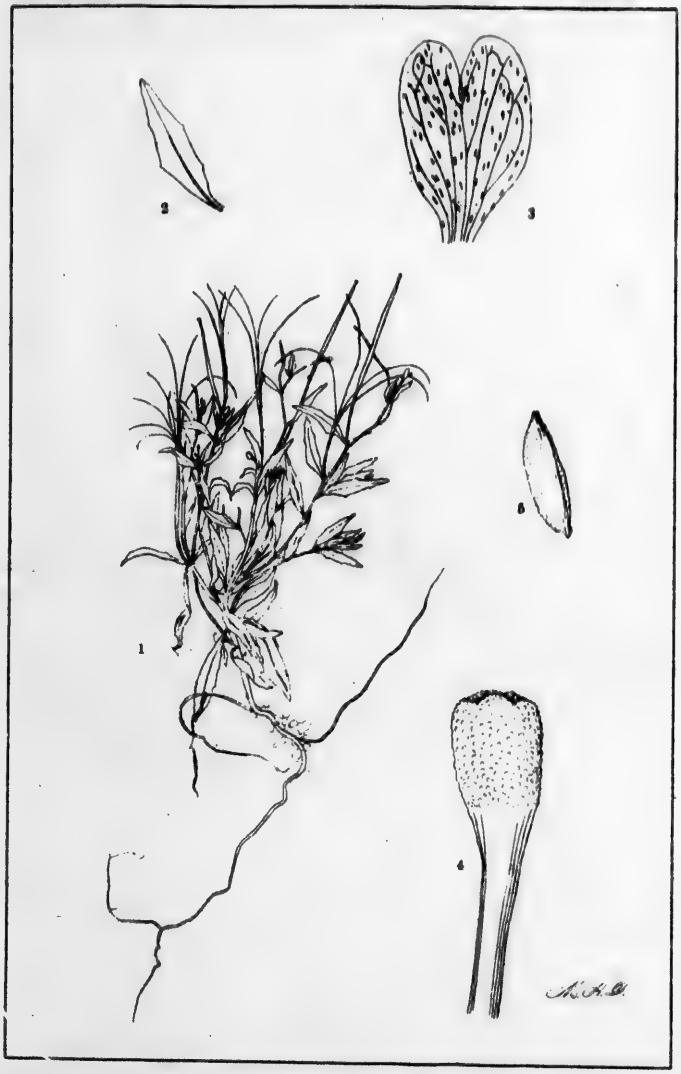

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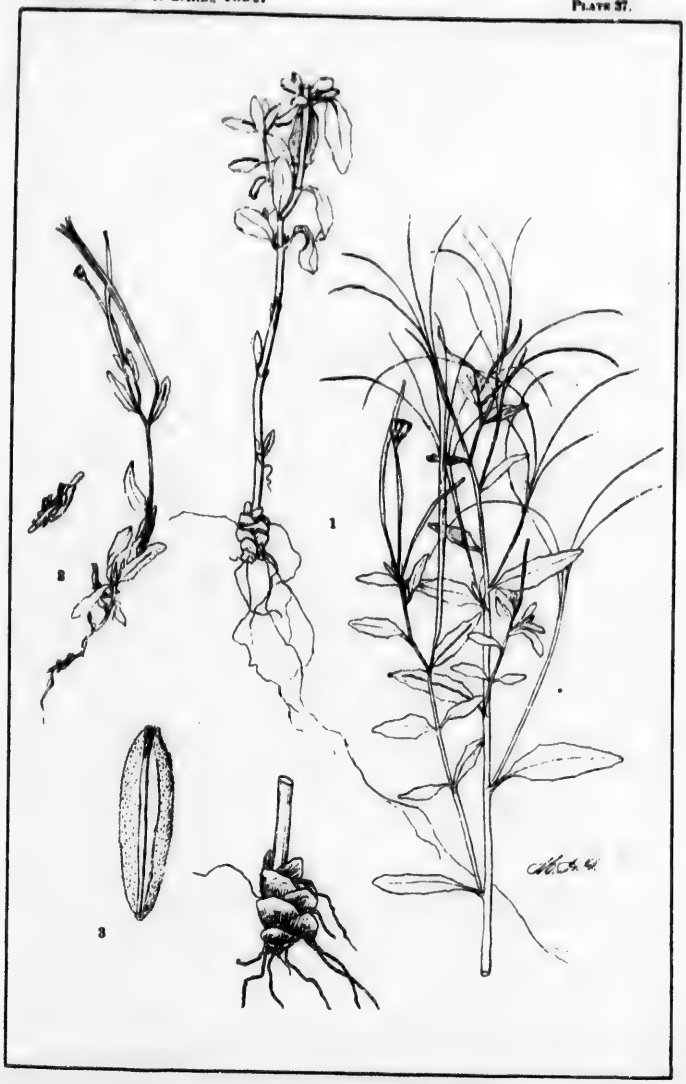

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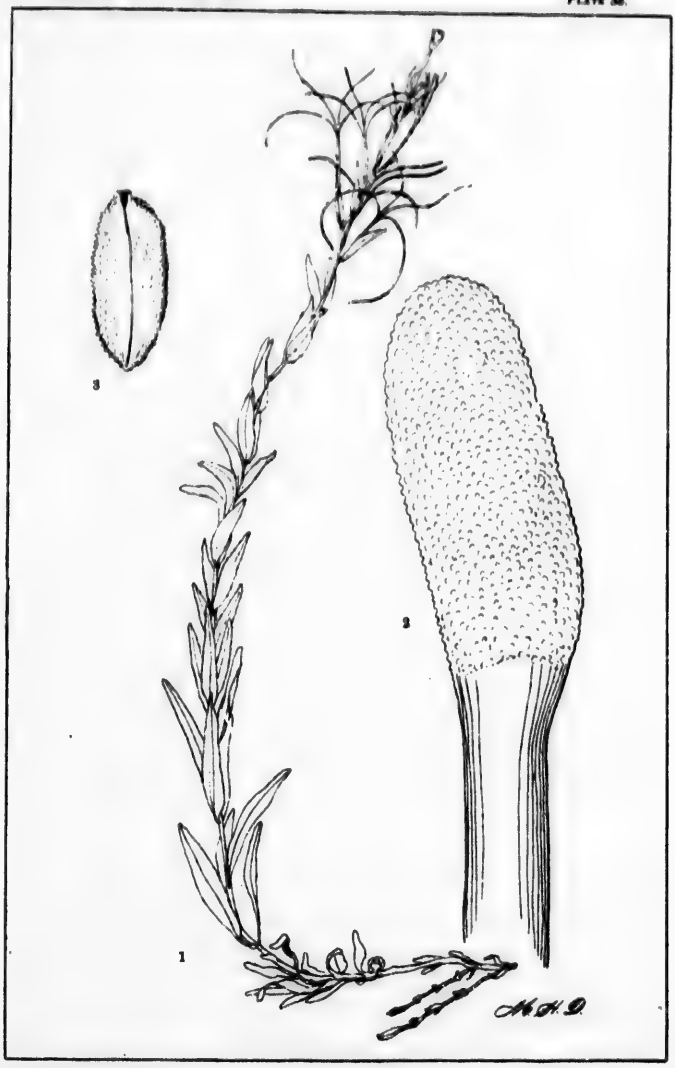

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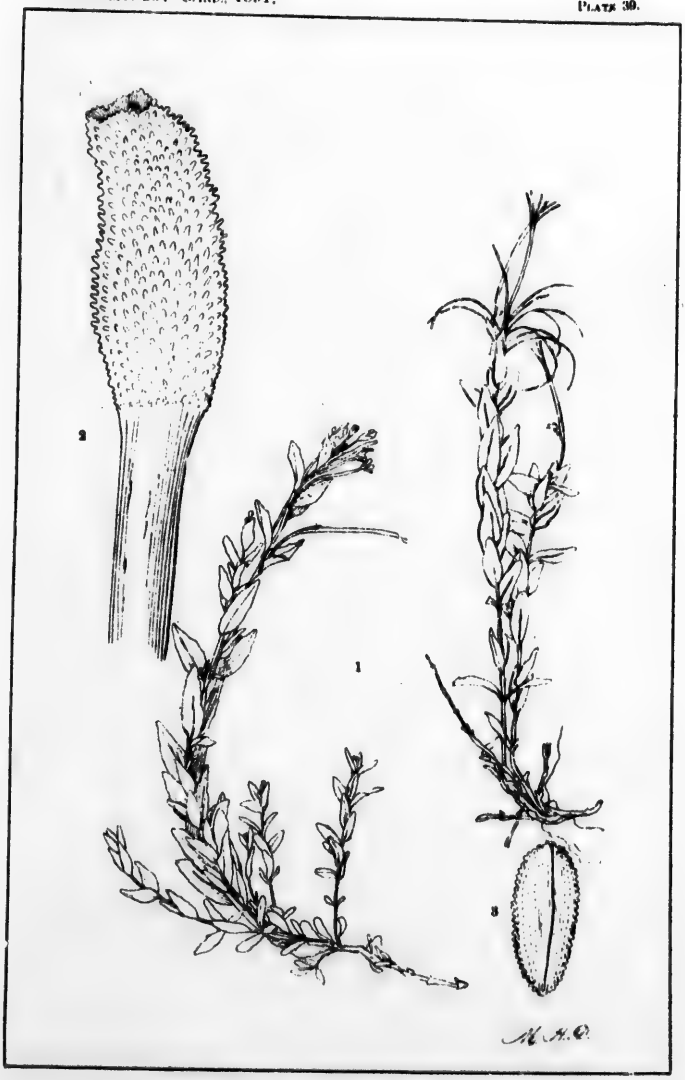

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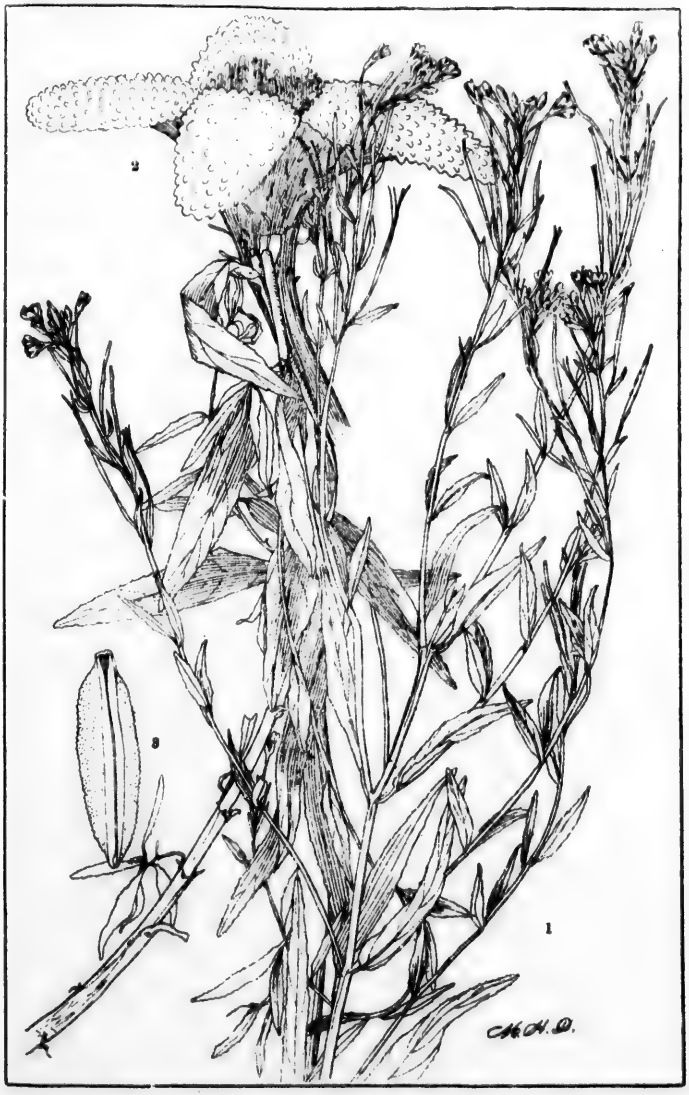

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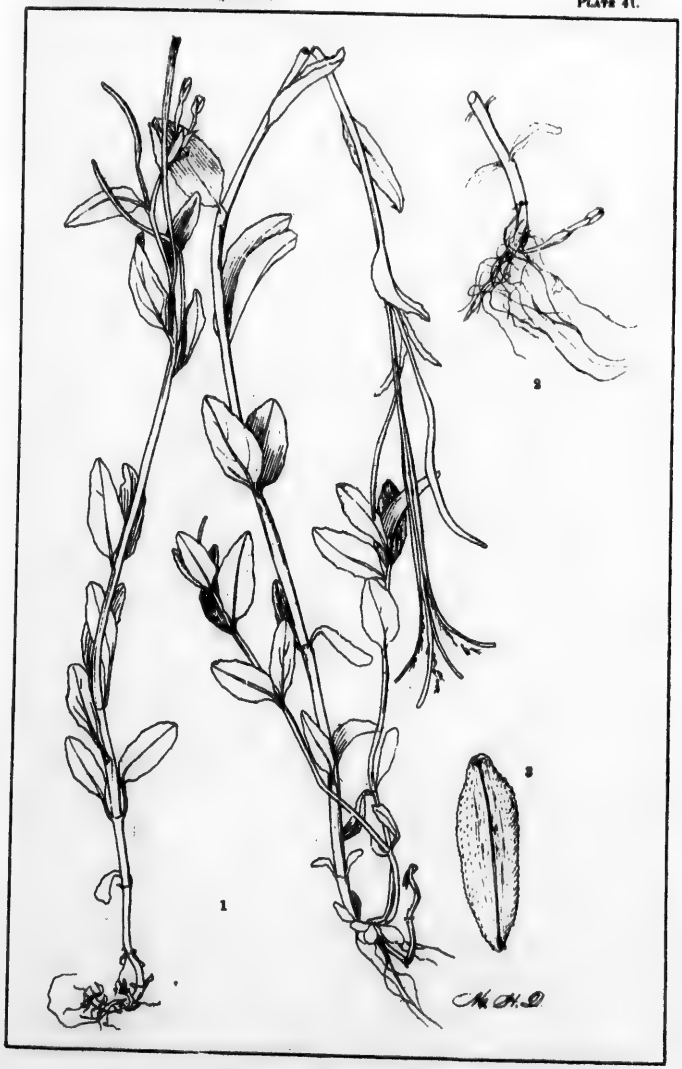

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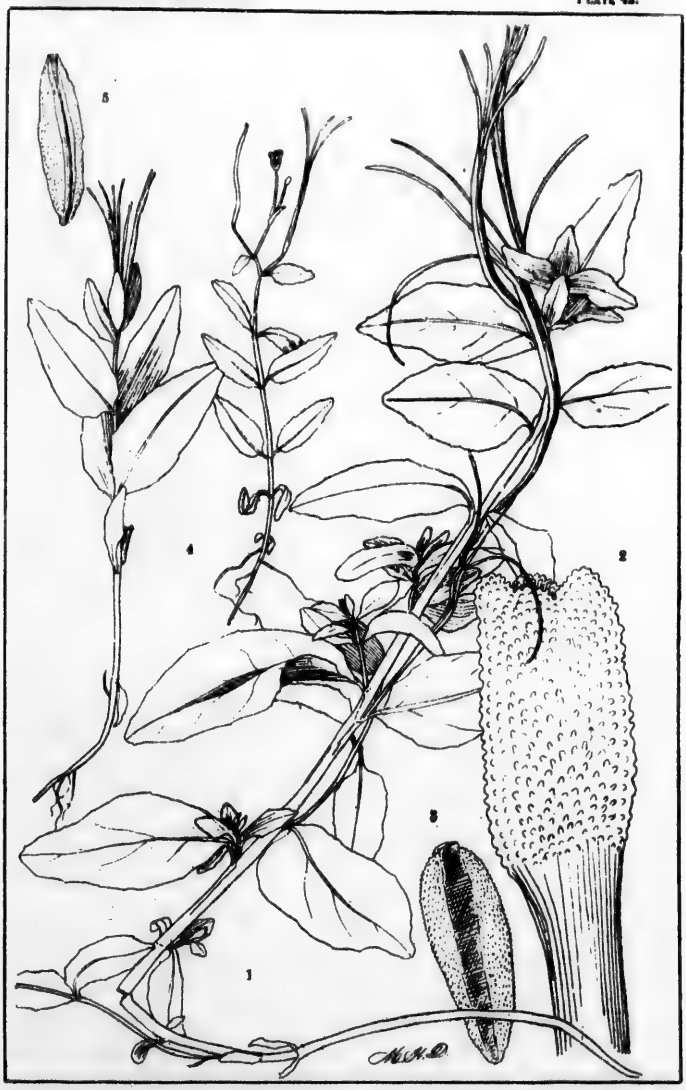

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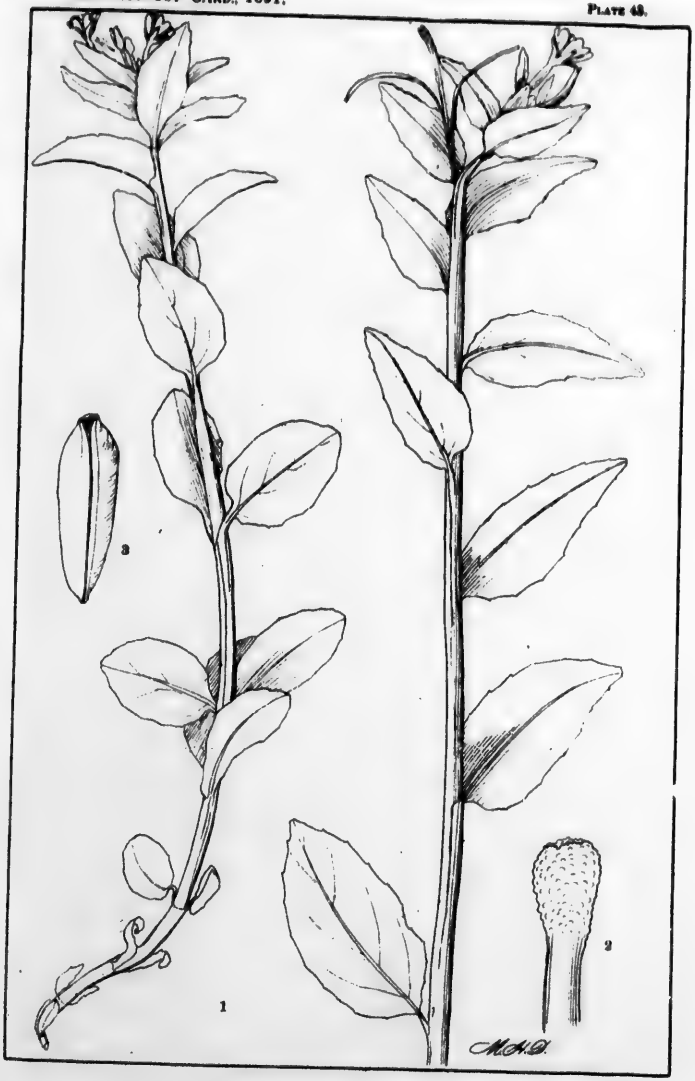

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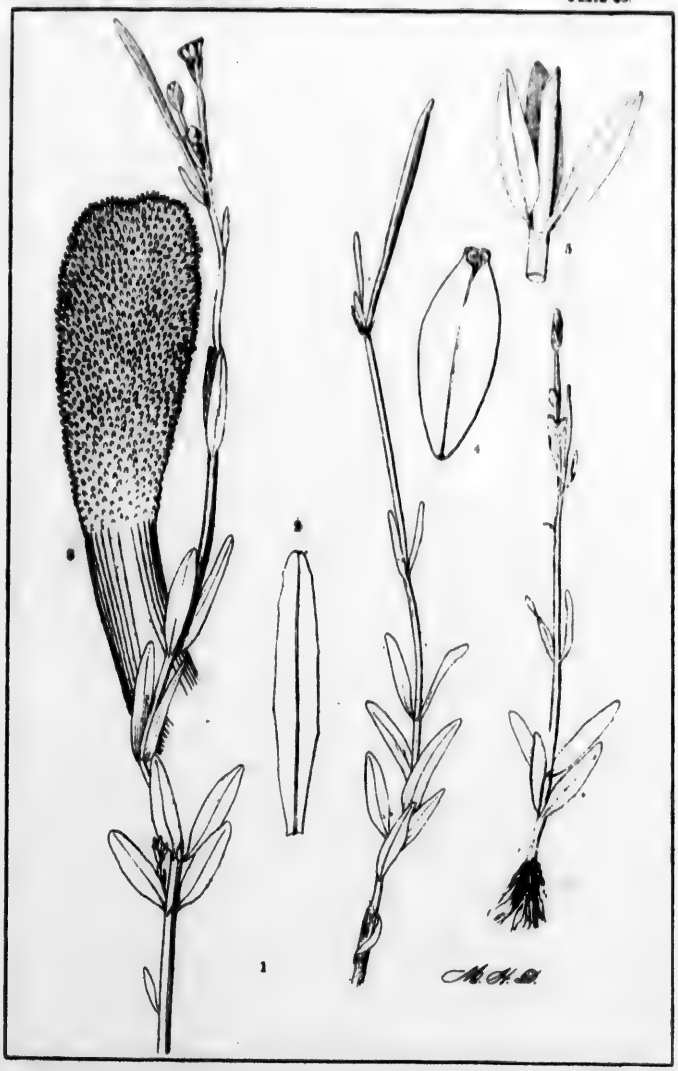

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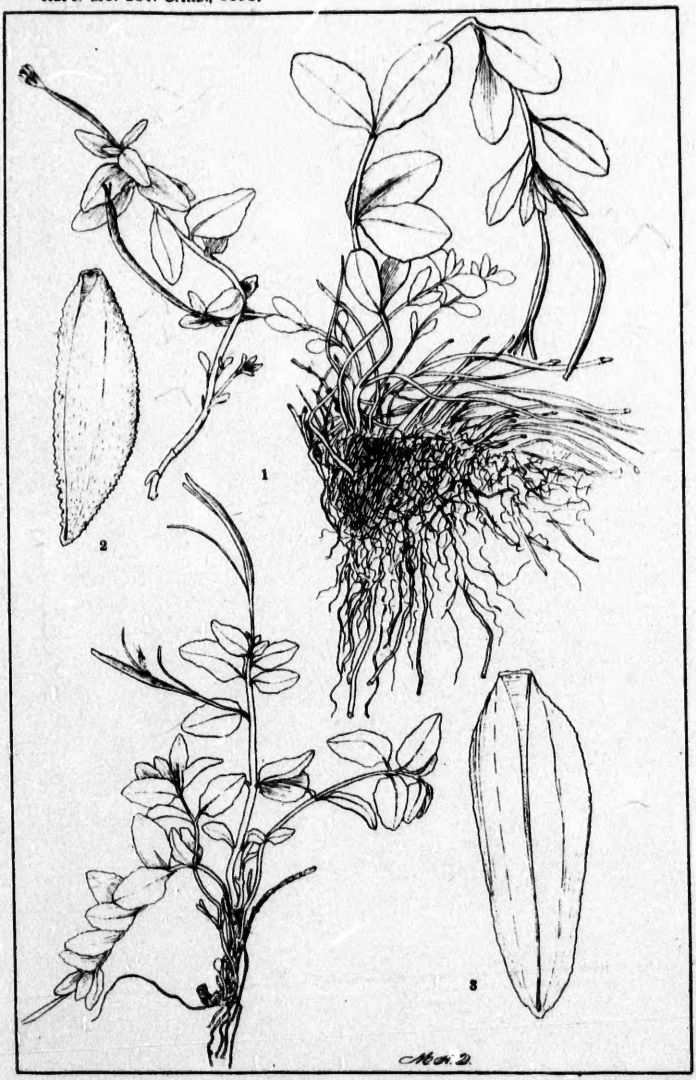
EPILOBIUM OREGONENSE, var. GRACILLIMUM.

EPILOBIUM ANAGALLIDIFOLIUM.



EPILOBIUM CLAVATUM.